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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The February issue is generally a good number. The interesting notes on Irrigation in Queensland, which have been going through the Journal for some months, are concluded; the tables quoted in the text have been reserved for the March Journal. Special features include a review of last year's activities in connection with Queensland stock, an informative article on pineapple-growing in Hawaii, notes on the activities of the Main Roads Board, and the first of a series of Entomological Notes. Other features traverse an extensive field, the regular article on breeds of pigs, and the second instalment of a paper on Insects Affecting Sugar-cane in North Queensland, being among the more important. Some of the contributions are excellently illustrated, and readers generally will appreciate this number.

The Cotton Industry.

At the last conference of the American Cotton-growers' Association, held in October last, resolutions bearing on the vexed question of cotton ratooning were carried. Preventive methods of checking the winter hibernation of the boll weevil, recommended by the Federal experts engaged in boll weevil experiments, were adopted. These experiments, supplemented by practical results obtained by successful cotton-growers, proved conclusively that the methods recommended could be confidently accepted. Chief among these preventive measures is the immediate ploughing up or turning under of cotton plants after harvest. This and other measures were fully approved by the conference, and every cotton-grower was urged to put them promptly into effect. Boiled down, the first preventive measure means that cotton ratooning should not be practised. To add weight to its decisions the conference further resolved to call upon bankers, merchants, and all other credit agents throughout the cotton States to check the credit for their cotton crops of all growers disregarding the preventive measures recommended by the Federal authorities. The conference also advised that for every 25 acres of land put under the plough the planting limit for cotton should be 8 acres, and that these 8 acres should be intensely cultivated. In other words growers are advised not to ratoon and to intensely cultivate small areas. Commenting editorially on the promise of cotton as a new and great Queensland industry, and referring to the efforts of the Government to found it firmly, the "Brisbane Courier" (23rd January, 1924) asserted that the Queensland growers ought to be guided by the experience of the producers in the cotton States of America, who have declared that ratoon cotton is a menace to the industry, because it provides harbourage for the dreaded boll weevil. The Queensland Government and its experts "are not banning cotton from a spirit of sheer opposition. They are doing it because science and experience say it is necessary for the salvation of the industry."

Conservation of Natural Pastures.

During the abnormally dry spell, now happily broken, nature presented very convincingly many strong arguments why the conservation of natural pastures should be regarded very seriously by every stockowner. Travelling through the country one frequently sees paddocks that, although covered by a fair growth of herbage, are entirely devoid of the original natural grasses. By overstocking and other forms of bad management grazing lands have been allowed to become eaten out and more or less useless herbage has been allowed to replace valuable native grasses. Year after year this experience is repeated, until it is now a rare sight to see a paddock with a good covering of native grasses in the more closely settled areas. This condition is not due to any vagaries of climate nor lack of vitality or seed fertility in the natural grasses; it is rather a consequence of a continuance of the bad practice of over-stocking. An occasional paddock shows evidence of good management in its covering of native grasses that will in due time seed and replenish, but pastures like that are not common. Contrarily, as a general experience, one oftener observes country eaten right out and badly stock sick. The result is that when rain comes after a dry spell weeds gain the mastery over the scantier and less vigorous grasses that through bad management have not been given a chance to re-establish themselves. In the first week of hot, dry weather the weeds and herbage wither; the first heavy wind drives the wilted and lightly rooted growth against the fences, there to be piled up to add to fire risks. The present favourable season is one in which advantage might well be taken to spell fed-out paddocks and give the natural grasses a chance to recuperate. Farmers are, of course, quite naturally tempted at a time like now to put a few more head of stock on to their grazing lands, but it would be well for them to look ahead to make sure that they are not stocking over the limit of safety.

A Vanishing Asset.

Figures in the last Commonwealth Year Book again remind us that the forest areas of Australia are diminishing. While the main objective of the settler in the past has been the improvement of grazing areas and the clearing of land for the plough by the destruction of timber, very little thought has been given to the need for re-afforestation. The enormous wealth in Australia's timber lands has become only recently to be fully appraised. Timber itself is a primary product, and in many new settlements it is often the first and most valuable crop taken off a selection. Scientists and economists the world over are concerned with forestry problems and the problem of re-planting denuded territories, but with us it seems that a decided, healthy, and forcible public opinion in favour of the conservation of one of our finest national assets needs to be created.

The Queensland Sugar Industry.

The twenty-third annual report of the Bureau of Sugar Experiment Stations, just to hand, refers to the grave anxiety that existed in sugar circles before the termination of the Federal agreement under which the industry had, to a large extent, become stabilised. The efforts towards a renewal of the covenant by the Queensland and New South Wales canegrowers, supported by the Beetgrowers' League of Victoria, are described. These efforts were strongly supported by the Queensland Government and representatives of the sugar industry, led by the Minister for Agriculture and Stock (Hon. W. N. Gillies), met the Prime Minister (Right Hon. S. M. Bruce), and urged upon him the importance of recognising the national as well as the economical value of the industry to the Commonwealth. The report stresses the strong national aspect of the question as presented by Mr. Gillies, and goes on:—"In the course of his address to the Prime Minister, Mr. Gillies said:—'We say emphatically that in the defence of this continent and the maintenance of a White Australia, the preservation and advancement of the Queensland sugar industry are involved. We believe that the industry can only be maintained and extended so as to provide all the sugar Australia requires by one or other of the methods now advocated. According to Press reports, a few days ago, you were speaking on defence and the importance of the navy. Battleships are necessary, but is not a girdle of white settlers round Australia . . . equally valuable? The new sugar-mill, costing half a million, about to be erected by the Queensland Government to open up the jungle lands of the Tully River, is as good an investment for defence as a modern battleship, for it will settle men there who will be ready to fight if needed. I am aware that there are differences of opinion regarding the policy of Government or State control of industry, but the delegation before you is made up of all shades of political thought, and it is at one on this question as far as the sugar industry is concerned. . . .'"

THE LIFE HISTORY AND CONTROL OF INSECTS AFFECTING SUGAR-CANE IN NORTH QUEENSLAND—*continued.*

BY EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

Continuation of a paper read by Mr. Jarvis before the Pan-Pacific Science Congress in Melbourne, in August, 1923.

7. Protection of Insectivorous Birds.

During the flighting season cane-beetles are greedily devoured by several of our native birds. The more useful of these are the white and the straw-necked ibises (*Carphibis spinicollis* and *Ibis molucca*); the laughing jackass (*Dacelo leachii*); and a few others.

8. Natural Control.

Insect Parasites.—Two species of Tachinidæ have been bred by us from greybacks confined in cages.

These flies probably oviposit on the beetles while the latter are resting by day in feeding-trees in a torpid condition, and doubtless act as a minor check on their increase.

One of these parasites is slightly smaller than a house-fly and has often been bred here; the number obtained from a single beetle varying from 5 to 12.

DROUGHT AND EXCESSIVE HEAT.

Natural control resulting from the occurrence of adverse meteorological conditions at a time when beetles are waiting to emerge from the ground are of immense benefit to all concerned.

A check of this nature may at times destroy from 50 to 75 per cent. of the beetles inhabiting an area of several hundred square miles of country.

During 1915, for instance, a dry spell lasting from July to November, kept the cockchafers imprisoned for nearly two months, causing thousands that had assumed the imago condition in September to simply perish helplessly in the pupal chambers.

Quantities of these dead beetles were ploughed up towards the end of November, and noticed lying in the furrows. Again, a check of a similar nature was experienced here eight years later (1922-23), and in many quarters reduced the usual losses from grub-attack to a minimum.

A noteworthy example of natural control, affecting beetles that had been weakened by prolonged confinement underground, occurred during December, 1915, when a heat-wave lasting two days caused myriads of beetles to drop dead from the feeding-trees. The temperature on this occasion varied from 95 degrees to 98 degrees Fah., the wind being from our warm quarter (north-west). No less than 25 dead specimens were collected from beneath one tree of *Eucalyptus tessalaris* of medium size; while on an area of forest land enclosing about two square chains 98 beetles were picked up. Of these, 27 were males, 49 females, and the remainder of doubtful sex owing to mutilation by ants.

Several specimens were dissected, and in all those examined the ovaries were found to be only partially developed. Two beetles contained 27 eggs each, most of which were more than half grown.

EGG STAGE.

9. Fumigation of Soil.

Experiments to test the effect of fumigation with carbon bisulphide on eggs of *albohirtum* were initiated during November, 1921.

These were confined to the laboratory, and have not yet been confirmed by field work. Eggs placed in cages containing from 130 to 280 cubic inches of soil were given ½ oz. injections of the fumigant, administered at distances varying from 6½ to 8 inches.

Twenty-four hours after treatment they were removed from the earth and placed in petrie-dishes on damp soil so that developments might be easily watched. Three days later the control eggs had become noticeably larger, and remained creamy-white, while fumigated eggs were dark-brown and more or less blotched with mould. This experiment was repeated on 24th of November with varying doses of bisulphide, similar results to the preceding being obtained in every case. Control eggs ultimately produced grubs; but all eggs subjected to fumigation perished a few hours after injection of the soil.

GRUB STAGE.

Unlike many other injurious species of root-eating scarabæidæ, *albohirtum* has a life-cycle of only twelve months, so that its grubs are present beneath cane stools during about six months of every year.

Instead of an elusive beetle, we have now to consider its sluggish larval form, which, being easily located in the soil, and satisfied to remain amongst cane roots, offers a very wide field for economic research; since during this stage in its life-cycle we are able to employ several remedial measures quite different from some of those alluded to in connection with control of the imago condition of this pest.

10. Poison Baits.

Possibilities in this direction were investigated at some length by the writer during 1915-16.

After experimenting at that time with a number of different poisons—the composition of which need not be enlarged on here—the cheapest and most effective proved to be aceto-arsenate of copper. Mortality of 100 per cent. in 15 days was obtained by dusting this arsenical on cow-pea leaves and then burying same in cages of soil, each containing a third-stage grub of *albohirtum*.

Paris green mixed with three times its weight of stale flour proved fatal to about 58 per cent. of cane-grubs in one week, 75 per cent. in 15 days, and 100 per cent. after the lapse of 25 days. Buried leaves treated with arsenate of copper remained palatable and effective for about five weeks.

Being of manurial value, this cow-pea bait was considered to be the most promising of those tested, although the grubs were also found to be very partial to sliced tubers of English and Sweet potatoes, pieces of sugar cane, and various succulent roots.

In my opinion it is imperative that any poison used should be applied in a highly concentrated form.

Judging by results given above, and by those attending later experimentation (1921-23), this phase of control presents a possible key to the solution of the cane-grub problem, and is deserving of very close study.

11. Hand Collecting.

The practice of picking up grubs behind the plough has been discontinued here during the last five years, although still followed up in other sugar centres of Queensland; our Cairns growers having evidently lost sight of the fact that every grub collected in this way means one beetle less; which, if a female specimen, may prevent the presence next season of 24 to 36 grubs, a number able to destroy at least four stools of cane.

This form of control is assiduously kept up in other sugar-growing countries; notably in Porto Rico, where collecting the grubs and beetles of *Phyllophaga* is said by experts to be "the only sure way of keeping this pest from increasing."[5]

12. Soil Fumigants.

The importance of this remedial method was stressed in my monthly report for March, 1915,[6] and since that date numerous experiments were carried out here during 1915-1917. In 1921-1922 the more promising of these fumigants were further investigated, both in laboratory and field, when it was discovered that *one* of them, which had given excellent results in laboratory work during April, 1915, proved equally successful when taken into the field.

This fumigant was para-dichlorobenzene, which at that time had never been experimented with as a possible remedy for root-eating scarabæid cane-grubs, so that our Department of Agriculture may be congratulated upon its having been the first to discover a fumigant which bids fair to be of great economic value as a controlling factor against one of the world's most notorious insect enemies of sugar-cane.

In field practice, injections consisting of a-quarter of an ounce of dry crystals of para-dichlor were placed 3 inches from cane stools, 4½ inches deep, and from 12 to 18 inches apart on each side of rows; at a time when grubs were in the second instar, and the cane about 2 feet high (25th January).

When examined three months later the cane, both in treated and control area, had attained a height of from 5 to 7 feet.

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[5] Journal Dep. Agric., Porto Rico, Vol. II., No. 1, Jan., 1918.

[6] Queensland Agric. Journal, Vol. III., p. 220.

One could, however, quite easily pick out the treated from the check rows, as the cane in the former had remained green and upright, whereas the untreated cane had become drooping and yellow in many places, owing to grub infestation.

As the dry weather continued, these differences became more marked day by day, until a fortnight later we obtained conclusive ocular demonstration of the efficiency of this fumigant as a grub destroyer.

Additional field experiments are being arranged for next season, when we hope to study various modes of application, &c., with a view to reducing the cost of material and labour to a minimum.

It may be of interest to mention that during dry weather ¼ oz. of para-dichlor., when left for fifteen days underground in volcanic soil at a depth of 7 inches, and during an average temperature of 60 deg. F., lost nearly half its weight, but did not completely evaporate until the end of six weeks.

Under wet conditions, both soil infection and evaporation were retarded. In moist clay-loam soils injections of 4 drachms last ½ a drachm during eighteen days, so that under such conditions evaporation might continue during a period of about four months. The odour remains in the soil for a fortnight or three weeks after complete evaporation of the crystals.

Laboratory experiments with carbon-bisulphide and various other soil fumigants need not be alluded to in detail just now, although I may mention that some of these have yielded encouraging results.

13. Poisonous Plants.

This phase of control work, which is being studied here at present, consists in endeavouring to discover some plant which, while possessing toxic principles, will at the same time prove palatable and attractive to cane-grubs.

Several poisonous plants have been tested recently on grubs confined in cages of soil in our laboratory, with the result that interesting data of more or less value has been obtained.

14. Larvicidal Solutions.

A series of experiments of this nature were carried on by the writer in 1916, results being summarised as follows:—Creolin 1 pint, water 50 gallons, killed 100 per cent. of grubs in cages, and applied to the roots at rate of 5 quarts per stool did not injure the cane. Potassium cyanide 1 lb., water 200 gallons, killed 100 per cent. of grubs. Borax 1 lb., water 3 gallons, proved effective, but too expensive for general purposes. Creosote 8 oz., water 5 gallons, emulsified with soap, gave fair results. Saltpetre 1 lb., water 3 gallons; Barium chloride 1 lb., water 3 gallons; Hellebore 1 lb., water 12 gallons, all gave negative results.

This form of control might prove serviceable on occasion for treating small plots of cane intended for seed, &c., but is unsuitable for general practice on a big scale.

15. Introduction of Wasp Parasites.

With regard to this fascinating subject I may mention that we have recently taken steps to obtain scoliid wasp parasites of cane-grubs from Java for introduction into North Queensland.

The most promising of these appears to be *Dielisthoracica* Fab. and *D. javana* Lep., both of which are parasitic in Java on grubs of *Lepidiota stigma* and other scarabæid beetles.

As a return for these we have already forwarded to Prof. Leefmans at Buitenzorg 239 cocoons of our *Campsomeris* digger-wasps for breeding and liberation in East Java. These were packed mostly in damp charcoal dust, but other methods of packing were tried by way of experiment.

16. Natural Control (Grub-Eating Birds and Mammals).

The most useful of these are the Ibis (already alluded to under control method No. 7, which, together with the Magpie-Lark (*Grallina picata*), Jackasses, and Indian Mynas (*Acridotheres tristis*), usually follow the plough as a matter of course, and are of great use to the canegrower.

Similarly, the common Bandicoot (*Peramelea* sp.) and probably other small native marsupials destroy a minor percentage of cane-grubs whenever these chance to occur plentifully, or while they are feeding close to the surface in a more or less exposed situation, as frequently happens during excessively wet weather.

17. Indigenous Wasp Parasites.

Our two principal scoliid wasps are *Campsomeris tasmaniensis* and *C. radula*, which have a life-cycle of from seven to eleven weeks, breeding practically throughout the year.

The number of cane-grubs victimised by these two species varies apparently from about 5 to 10 per cent., their increase being efficiently checked by various controlling factors.

Three of these are the hyperparasites *Macrosiagon pictipennis* Lea, *Hyperalonia satyrus* Fabr., and a *Conopid* fly (undetermined), which subsists on the eggs and larval stages of these digger-wasps. In addition to the above checks on their increase, the Green Muscardine fungus occasionally kills both adults and maggots of *Campsomeris*, while *acari* and *bacteria* destroy many of their eggs.

An account of the life-history and metamorphosis of these interesting insects was published last year (1922) in our Agricultural Journal.[7]

Scolia formosa has also been recorded by the present writer as being parasitic on *albohirtum*, but is a comparatively rare species, and probably of very minor importance in the Cairns district.

18. Predaceous Insects.

These include two or three species of Asilidæ and one of Elateridæ, whose soil-frequenting larvæ puncture and suck the life-juices from various cane-grubs.

Other predaceous insects (Carabidæ, Formicidæ, &c.) probably destroy an insignificant percentage of larvæ of the greyback cockchafer, but have not yet been closely studied.

19. Entomogenous Fungi.

A small number of *albohirtum* grubs succumb each year from the insidious invasions of the Green Muscardine fungus (*Metarrhizium anisopliæ* Metch.) that generally appears just after commencement of our so-called wet season, being more or less in evidence throughout March, April, and May.

The occurrence of this vegetable parasite, however, is very local, and we intend trying to extend its sphere of usefulness in the near future by cultivating large quantities of spores for uniform distribution over cane areas liable to serious grub-infestation.

20. Bacterial Diseases.

The commonest of these is a species of *Coccobacillus*, which occurs spasmodically in certain localities, and, although perhaps of little value, is worth recording here.

Healthy grubs inoculated by us with this disease developed black patches on the legs and along the spiracular area resembling those known to be characteristic of *C. nigrofasciens*, and died within three to five days.

PUPA STAGE.

21. Fumigation with Carbon Bisulphide.

The pupa of *albohirtum* occupies a position of complete isolation, lying not only at a greater depth than the eggs, but being placed in a specially prepared chamber having walls lined and puddled with soil in a manner calculated to exclude small insect enemies and prevent it from either drying up or being harmed by heavy rains.

Our attempts to destroy these pupæ have been limited to preliminary experiments with carbon bisulphide, which, however, was found to kill them, both in cages of soil and outside under field conditions. Further experimentation is being planned for the coming season (1923).

LEPIDIOTA FRENCHI BLACKB.

Fortunately this cockchafer has a two-years life-cycle, and only damages cane seriously every second season. Its metamorphosis and life-history have been described in our various bulletins[8] so will not be dealt with here.

The beetle, which is of a uniform dark reddish-brown, measures about 25 by 12 mm., and emerges from the soil a week or so later than *albohirtum*. It is widely distributed throughout forest country its larvæ feeding for the most part on roots of grasses and small herbaceous plants. Unlike *albohirtum*, the beetles hide during the day in close concealment amongst the stalks and surface roots of weeds and miscellaneous vegetation.

Our experimentation as a whole has naturally embraced the grubs of both *albohirtum* and *frenchi*, since they frequently occur together under the same stool of cane.

The control methods already advocated for beetles of *albohirtum*—excepting Nos. 2, 4, 5, 8, 9, 13, and 14—are applicable also to those of *frenchi*. During the third instar the grubs of both species are very similar in general appearance, but may at once be separated by a glance at the arrangement of the phototropic bristles situated ventrally on the anal segment. Although positively phototropic, reaction of the beetles towards acetylene light is not so marked as in those of *albohirtum*.

RHABDOCNEMIS OBSCURUS BOISD.

This well-known weevil-borer appears to be on the increase, and of late years has called for repressive measures. The only control attempted here at present is the breeding and liberation in affected areas of the tachinid fly parasite, *Ceromasia sphenophori* Vill.

Our cages used for this work measure about 6 by 8 by 7 feet, and from these hundreds of flies have been bred and distributed. Results so far have been very encouraging, and this work will be continued during the coming season.

During the course of breeding experiments several improved methods of handling and tending these flies during captivity have been evolved by the writer, or which the following may be of interest to economic entomologists:—

In place of using split cane for feeding purposes we section the stick transversely into 4-inch lengths, and then stand each piece with buds pointing upwards in a pot of water (an ordinary 2-inch vaseline jar). The water, rising by capillarity, keeps the exposed upper ends of the pieces continually moist for two days or longer, so that the food remains palatable all the time and need not be renewed so often.

The common canna, transplanted when about 18 inches high into kerosene tins filled with soil, provides excellent broad leafage for spraying and shelter from heat, as the drops adhere slightly to the surface of these leaves and do not evaporate quickly. Canes used for holding borer grubs to be placed in cages should be detached from the stool after lifting same, all side roots cut away close up to the stick, the basal rooting portion washed to remove soil or ants, &c., and, having been stocked with grubs at each internode (excepting three or four at top of canes), should be planted about 6 inches apart in tins of soil, holding, for convenience of handling, from six to eight sticks. Wads used for plugging holes after inserting grubs should consist of small fragments of borer cocoons, and it is very important that the substance of these wads should not be pressed tightly together, and should be inserted loosely in the holes with just sufficient grip to keep them from falling out. For making the holes we find a 5/16-inch cork-punch to answer best.

ANOPLOGNATHUS BOISDUVALI BOISD.

Grubs of the so-called "Christmas Beetle" often occur under cane, and at times materially damage the crop.

The beetle may be observed from January to February resting or feeding during the day on foliage of *Eucalyptus platyphylla* or other food-plants. The elytra of this beautiful insect are pale creamy-grey ornamented with irridescent flashes of pink and green, its head, prothorax, and scutellum being metallic greenish-gold, and the tibiæ and tarsi purple.

PHRAGMATIPHILA TRUNCATA, WALK.

Of late years this well-known moth-borer has been troublesome in some of our sugar centres, chiefly, however, to young ratoons and plant cane. Although in evidence each season in the Cairns district, infestations are very local, seldom becoming serious, owing mainly to the occurrence of a tiny braconid wasp (*Apanteles nonagriæ* Oliff.); and in part to the presence of *Pheidole megacephala* in most of our canefields.

This braconid parasite was discovered by Oliff. in New South Wales in 1893, and recorded for the first time in Queensland by the present writer in 1919. During December, 1921, whilst breeding specimens of *nonagriæ* in cages at Meringa Laboratory we found the period occupied by its life-cycle to be only sixteen to twenty-one days; and obtained a maximum record of ninety-three eggs from one female.

This parasite is not difficult to breed, and in view of its very brief life-cycle and effective control of our large moth-borer might, if introduced elsewhere be found to attack other lepidopterous cane-borers.

Miscellaneous Insects Affecting Sugar-cane.

Many of the insects given in the following list are responsible for minor damages to the roots, stems, and leaves of cane.

Although apt to disregard minor injuries caused by individual species, such as leaf-eating coleoptera, &c., these may, nevertheless, become quite appreciable when chancing to occur over extensive cane areas.

Insects Boring Cane Stalk and Midrib of Leaves—

Polyocha sp.—Moth-borer attacking young ratoons and causing "dead-hearts."

Tineid Moth-borer (undetermined).—Habits similar to those of preceding species, but the larvæ destroy mostly very young shoots of third and fourth ratoon crops.

Opogona glycyphaga Meyr.—Bud-moth eating eyes of Badilla, H.Q. 426, &c.; gnawing surface of rind near buds, boring into soft varieties of cane.

Loxostoma sp.—Habits similar to preceding species.

Cosmopteryx sp.—Tunnelling in midrib of cane leaves.

Insects Eating "Sets" and Stalks, below ground—

Heteronychus sp.—Gnawing cavities in basal portion of young cane, causing "dead-hearts." Does serious local damage in some sugar centres.

Pentodon australis Blackb.—Habits very similar to those of the preceding insect.

Monocrepidius sp.—Preventing good "strike" by eating eyes of sets after planting.

Termes meridionalis.—Destructive to newly planted "sets."

Mastotermes darwiniensis.—Attacking and completely destroying cane sticks, leaving only the rind; sticks 3 to 4 feet are reduced to hollow tubes.

Insects Eating the Leaves—

Locusta danica Lin.

Locusta australis Brunner.—Causing serious damage at times over extensive areas by devouring the leaves, leaving only the midribs and stalks.

Atractomorpha crenaticeps Blanch.

Oxya velox Fab.

Cyrtacanthracris (*plagiata*?)

Cyrtacanthracris (*guttulosa*?)

Causing minor damages to the leaves.

Cirphis unipuncta Haw.

Cirphis lorevi Dup.

Laphygma exempta Walk.

More or less in evidence each season; and occasionally stripping cane leaves to the midrib over localised areas of considerable extent.

Chusaris rhodias Turner.

Spodoptera mauritia (Boisd.) Hamp.

Parnara mathias Fab.

Telicota augias-kreffti MacL.

Padraona marnas Feld.

Padraona hypomoloma Lower.

Melanitis leda Linn.

Mocis frugalis Fab.

Ophiusa melicette Drury.

Harmologa miserana Walk.

Occasioning minor injuries to the leaf-blade.

Rhyparida morosa Jac.

Rhyparida didyma Fab.

Rhyparida (*basipennis* Lea.?)

Eating holes in the leaves; of minor economic importance.

Sap-sucking Insects—

Tetigonia parthaon Kirk.
Perkinsiella saccharacida Kirk.
Aphis sacchari.
Aphis sp.
Aphis sp. (on roots and underground portion of shoots from "set").
Aleurodes berghi Sign.
Pseudococcus (*calceolariæ* Mask.?).
Ripersia sp.

Causing minor damage to the foliage, &c.

Root-eating Insects—

Lepidiota caudata Blackb.
Lepidiota consobrina Girault.
Lepidiota rothei Blackb.

Destructive to cane on areas adjoining scrub land. *L. caudata*, which displays similar habits to those of *L. frenchi*, is said to cause serious losses to growers around Babinda.

Dasgynathus australis-dejeani MacL.
Anomala australasiæ Blackb.
Isodon punctticallis MacL.
Cacachroa decorticalis MacL.

Found occasionally in canefields, but of very minor economic importance. The grubs of *Anomala*, however, occur commonly under trash and among cane roots.

CATTLE MORTALITY AT JANDOWAE—GRASS-TREE THE REPORTED CAUSE.

Accompanied by the Stock Inspector for the Dalby District (Mr. J. H. McCarthy), the Government Botanist (Mr. C. T. White) recently made an inspection for the purpose of finding poisonous plants on properties where deaths among cattle had occurred.

In all cases the cattle were running on grass-tree country and had eaten freely of it, particularly of the flowering poles. The symptoms are similar to those exhibited by cattle running on grass-tree country on the coast and commonly known as "North Coast disease," viz., stiffness of movement in the majority of cases associated with incontinence of urine. In other respects the beast appears healthy, eyes bright, temperature, respiration, and pulse normal. The stiffness increases, involving paralysis of the muscles of the back, the paralysis continuing until the beast can no longer maintain a standing position. One is forced to the conclusion that the grass-tree must be the cause of the trouble. Both on the North Coast line and on the Downs losses occur between the months of October and February. It is also further thought that the flowering pole or spike is the principal cause, and it is worthy of note that this year there has been an exceptionally heavy crop of flowering poles. Other observers are of the opinion that the young leafy shoots following on summer rains are the cause of the mortality. The explanation is probably that any part of the plant may be dangerous to stock. The flowering poles and young shoots following rain are the only parts eaten freely by cattle, the other leaves being too coarse and unpalatable for them to feed on to any sufficient extent. Cattle should therefore be kept off grass-tree country from the latter part of September to the end of February.

Feeding experiments carried out in New South Wales with the leaves of the grass-tree and in Queensland with the flowering poles gave negative results, but the experiments were probably not conducted on a scale exhaustive enough to prove conclusive.

On the grass-tree country was seen a fair growth of a grass-like plant with blue flowers (*Dianella laevis*). This plant has been suspected of poisoning stock both here and in New South Wales, and it is hoped to carry out feeding experiments with this at an early date. This was the only other reputedly poisonous plant found in the country.

As a few cows had died since their removal from the grass-tree country to other paddocks, an examination of these better class pastures was made, but nothing of a suspicious nature was revealed. A few odd plants of Darling Pea (*Swainsonia*) and Rattlepod (*Crotalaria*) were observed, but in neither was in sufficient quantity of be harmful to stock.

UPPER BURNETT SETTLEMENT.

MULGELDIE DEMONSTRATION AREAS.

Four demonstration plots, comprising a total area of 80 acres, typical of different classes of land to be found in the Upper Burnett, were established by the Department of Agriculture and Stock under the direction of the Director of Agriculture (Mr. H. C. Quodling) in June of last year.

The objective aimed at was to demonstrate the capacity of these lands to produce profitable cotton, grain, and fodder crops, and to engage in experimental work of a practical nature with which to provide data of benefit to incoming settlers.

Attention was also given to seed selection in connection with cotton, for the purpose of developing special strains of seed for the locality.

A climatological station was established to record definite data, which, in addition to the ordinary services, embraces:—

Registration of the amount of evaporation from a water surface;

Automatic recording of changes of temperature, both night and day, by means of a thermograph;

Recording of soil temperatures at different depths; and

Monthly tests of the amount of moisture present at regular depths in the soils on experiment plots.

Official Rainfall Records.

Monthly averages, taken over period of thirty-two years—

	Points.
January	425
February	332
March	313
April	139
May	159
June	197
July	124
August	124
September	152
October	229
November	241
December	371

Yearly average: 28.86 inches.

From this table it will be seen that the Upper Burnett compares favourably with most of our recognised agricultural districts. Most of the rain falls between October and March, a period coinciding with the sowing and first picking of the cotton crop. The district is suitable for the growing of summer crops.

With the adoption of good farming methods, and by paying attention to the conservation of soil moisture, many winter fodder crops may also be grown to advantage.

Details of Demonstration Areas.

Plot No. 1—Hurdle Gully.

Soil:—Light brown clayey loam, overlying sandy subsoil.

This soil is of fairly good quality and suitable for the production of cotton and fodder crops. An analysis of the soil from this plot shows it to be a little deficient in phosphates.

The plot was well prepared and sown early in November, 1922, with Durango cotton, maize, cowpeas, feterita (grain sorghum), and Japanese millet. A number of small trials were carried out with different varieties of sorghums, panicums, and millets.

Yields from the cotton and maize were rather low, owing to the light rains during the normal wet season. February proved to be the driest month experienced in this district for a period of fully forty years.

Other summer fodders, including cowpeas, gave good returns.

YIELDS PER ACRE.

—	Fodder.	Grain.
Feterita	12 tons greenstuff	30 bushels
Manchurian Millet	2 tons of cured hay ..	..
Japanese Millet	1 ton 11 cwt. cured hay ..	..
Imphee	18 tons green fodder ..	..
Cowpeas	4 tons green fodder ..	10 bushels seed
Maize	15 tons green fodder ..	..

Plot No. 2—Camp Site, 8-Mile Dip Yards.

Soil:—Sandy, merging into light grey loam overlying a heavy clay subsoil.

A rather poor soil typical of some of the second-class lands used for grazing in this locality.

This plot was sown with cotton, cowpeas, peanuts, and Sudan grass in November last, and produced some good crops. Sudan grass grew to a height of 6 feet and produced 3 tons of dried hay per acre, in spite of the adverse season. Peanuts yielded 1,250 lb. of nuts per acre, the sample being of good quality. Cowpeas gave 1½ tons cured hay, and the portion harvested for grain yielded 8 bushels of seed per acre. The oats (Algerian) failed to mature.

Plot No. 3—Alluvial Flat, Three Moon Creek.

Soil:—Alluvial loam of considerable depth.

A first-class soil, ideal for lucerne growing. A small area of Hunter River Broadleaf sown this year, in July, made excellent growth. The plants rooted well and produced a good length of stalk, with an ample supply of leaf.

Huban clover (*Melilotus* spec.) sown a little earlier than the lucerne, made a very satisfactory start and promises to give a good return as soon as the plants are well established.

A series of fodder test plots were laid out on this block in the autumn to try out various cereals and cereals in combination with field peas.

FODDER TESTS—YIELDS PER ACRE—WINTER, 1923.

—	"Florence" Wheat.		"Florence" Wheat and Peas.		Rye.		Rye and Peas.		Skinless Barley.		Skinless Barley and Peas.		Cape Barley.		Cape Barley and Peas.	
	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.
Green weight	8	18	8	19	4	7	4	5	8	1	8	2½	6	15	6	12
Weight cured hay	3	4	3	4	1	12	1	7	3	2	3	2½	2	5	2	1

Plots laid down.—12th June, following 270 points of rain.

Cut for hay.—Wheat, rye, skinless barley on 21st September, and Cape barley on 5th October.

Growing period—14 weeks 3 days.

Rainfall during growing period—268 points.

Plot No. 4—Area 40 acres; Monto Scrub (Brigalow with a little belah and softwood).

Soil:—Dark brown loam, rich in vegetable matter. Subsoil—Dark-grey coloured clay.

Scrub was felled in August, 1922, and a good burn obtained at end of November. Rhodes grass seed was broad-casted at end of January, a good germination taking place after the March rains.

A splendid stand of grass was obtained, which seeded before the first frost.

These scrub soils are fertile, and, when improved, make excellent dairying country; the clay subsoil holds the moisture over long periods of dry weather. Soils of this description and the lighter classes also are suited for the production of cotton crops. Evidence of development work on country of this character is to be seen in the Mundubbera and Holywell districts.

Conservation of Natural Grasses.

The flats adjacent to the creeks running through the settlement annually produce large supplies of excellent grasses well suited for the production of bush hay. To demonstrate this fact the grass on an area of eight acres near Three Moon Creek was mowed and made into hay last March. This was stacked and fed to the working horses during the winter months, being used in conjunction with panicum and cowpea hay. The horses showed a preference for the bush hay and kept their condition well, although working constantly.

The principal tall-growing grasses on these flats are:—Kangaroo grass (*Anthistiria ciliata*), Blue grass (*Andropogon intermedius*), Wild sorghum (*Andropogon* sp.), and an assortment of herbage and grasses which have established the district's reputation as an excellent stock-carrying and fattending area.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1923 AND 1922, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1923.	Dec., 1922.		Dec.	No. of Years' Records.	Dec., 1923.	Dec., 1922.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	7·57	22	6·51	12·12					
Cairns	9·02	41	7·18	1·97	Nambour	6·26	27	6·62	5·15
Cardwell	8·44	51	7·51	7·71	Nanango	3·74	41	6 06	5·19
Cooktown	6·98	47	1·98	1·54	Rockhampton ...	4·69	52	3 41	4·13
Herberton	5·69	36	4·46	6·08	Woodford	5·39	36	7·58	4 66
Ingham	7·16	31	7·12	5·85					
Innisfail	12·05	42	13·39	4·41					
Mossman	12·24	51	6·86	4·42	*Darling Downs.*				
Townsville	5·55	52	2·04	6·82					
					Dalby	3·07	53	7·92	1·80
Central Coast.					Emu Vale	3·61	27	3·99	4·35
					Jimbour	3·13	35	3·67	2·16
Ayr	3·91	36	3·07	5 94	Miles	2·58	38	7·35	4·16
Bowen	4·48	52	3·26	7·34	Stanthorpe ...	3·53	50	2·91	5·87
Charters Towers ...	3·63	41	2·66	6·12	Toowoomba ...	4·19	51	7·35	3·78
Mackay	6·87	52	2·86	5·86	Warwick	3·51	58	3·55	4·29
Proserpine	8·83	20	4·16	7·59					
St. Lawrence ...	4·62	52	2·58	11·16					
					Maranoa.				
South Coast.									
					Roma	2·40	49	3·68	5·30
Biggenden	4·44	24	5·13	3·61					
Bundaberg	4·73	40	3·78	4·79	*State Farms, &c.*				
Brisbane	4·93	72	2·92	4·59					
Childers	5·42	28	8·13	8·67	Bungeworgorai ...	3·03	9	1·94	7·10
Crohamhurst ...	6·83	30	9·09	8·96	Gatton College ...	3·43	24	3·88	3·08
Esk	4·40	36	6·30	6 22	Gindie	2·67	24	4·28	3·98
Gayndah	3·93	52	7·91	4·26	Hermitage ...	3·08	17	3·40	3·85
Gympie	5·74	53	5·19	6·30	Kairi	7·05	9	2·34	4·06
Glasshouse Mts. ...	6·70	15	...	6·44	Sugar Experiment Station, Mackay	8·12	26	3·16	4·85
Kilkivan	4·27	44	7·85	3·94	Warren	3·83	9	1·38	4·19
Maryborough ...	4·69	52	5·59	6·38					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December, 1923, and for the same period of 1922, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
State Meteorologist.

REPORT ON EGG-LAYING COMPETITION—QUEENSLAND AGRICULTURAL COLLEGE, DECEMBER, 1923.

Changeable weather caused a decrease in the laying of the competition birds. The heat wave on the 18th-19th of December caused ten deaths, and a great many of the birds were affected to some extent. In the light breeds Mr. G. W. Hindes leads with 141 eggs, next is Mr. N. A. Singer with 140 eggs. In the heavy breeds Mr. R. Burns leads with 124 eggs, with Mrs. E. Gallagher's birds 122 eggs. Mr. R. Burns' "E" bird has finished a sequence of 57 eggs.

The following are the individual records:—

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS.			
*C. H. Singer	White Leghorns	138	1,229
*W. and G. W. Hindes	Do.	141	1,219
*N. A. Singer	Do.	140	1,210
*Oakleigh Poultry Farm	Do.	124	1,116
*Ancona Club	Anconas	113	1,063
H. P. Clarke	White Leghorns	132	1,045
*S. L. Grenier	Do.	108	1,039
*Beckley Poultry Farm	Do.	119	1,034
*J. W. Newton	Do.	122	1,021
*R. C. J. Turner	Do.	131	1,015
*Mrs. L. Andersen	Do.	16	1,004
*O. Goos	Do.	112	983
*Rock View Poultry Farm	Do.	104	977
*Geo. Williams	Do.	109	965
*J. A. Manson	Do.	110	954
*Bathurst Poultry Farm	Do.	108	937
F. Sparshott	Do.	64	929
*Arch. Neil	Do.	102	925
*J. W. Short	Do.	90	917
*Mrs. R. Hodge	Do.	96	906
*J. Purnell	Do.	109	879
*A. C. G. Wenck	Do.	82	869
*H. Fraser	Do.	100	869
Jas. Hutton	Do.	66	864
G. Marks	Do.	53	852
G. E. Rogers	Do.	82	850
W. Becker	Do.	72	825
W. A. and J. Pitkeathly	Do.	76	825
*N. J. Nairn	Do.	103	812
J. Harrington	Do.	76	806
E. Ainscough	Do.	87	801
W. and G. W. Hindes	Brown Leghorns	76	787
C. Quesnell	White Leghorns	56	779
Chapman and Hill	Do.	65	764
*Mrs. E. White	Do.	82	761
Jas. Earl	Do.	54	747
Parisian Poultry Farm	Do.	100	668
HEAVY BREEDS.			
*R. Burns	Black Orpingtons	124	1130
*W. Becker	Chinese Langshans	116	1100
*Jas. Potter	Black Orpingtons	112	1086
*Mrs. A. E. Gallagher	Do.	122	1077
*Jas. Ferguson	Langshans	115	1064
*Jas Hutton	Black Orpingtons	84	994
*Mrs. A. Kent	Do.	95	972
*Parisian Poultry Farm	Do.	..	969
J. N. Mants	Do.	..	964

EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE—*continued.*

Competitors.	Breed.	Dec.	Total.
HEAVY BREEDS—*continued.*			
*E. Walters	Black Orpingtons	100	966
*T. Hindley	Do.	102	962
J. R. Douglas	Do.	76	925
W. T. Solman	Do.	81	913
*R. Holmes	Do.	94	911
*H. M. Chaille	Do.	91	900
*E. F. Dennis	Do.	80	916
H. B. Stephens	Do.	117	876
*C. C. Dennis	Do.	86	874
R. Conochie	Do.	77	871
*J. H. Jones	White Wyandottes	90	855
Beckley Poultry Yards	Do.	84	841
G. E. Rogers	Do.	70	820
A. McAllister	Do.	65	810
D. F. Ruhl	Do.	79	806
Jas. Ferguson	Plymouth Rocks	69	762
W. G. Badcock	Chinese Langshans	64	730
J. Rye	Black Orpingtons	80	725
F. J. Murphy	Do.	83	707
Jas. Ferguson	Rhode Island Reds	60	606
Mos. Stephens	Do.	56	576
Totals		5,990	60,954

* Indicates that the pen is being tested singly.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
C. H. Singer	185	250	202	178	194	220	1,229
W. and G. W. Hindes	189	211	200	179	223	217	1,219
N. A. Singer	177	213	225	211	192	192	1,210
Oakleigh Poultry Farm	197	197	176	174	195	177	1,116
Ancona Club	161	186	221	145	161	189	1,063
H. P. Clarke	189	142	187	162	186	179	1,045
S. L. Grenier	152	178	197	170	176	166	1,039
Beckley Poultry Farm	175	159	150	180	184	186	1,034
J. W. Newton	183	174	165	152	170	177	1,021
R. C. J. Turner	164	173	170	166	155	187	1,015
Mrs. L. Andersen	144	175	184	179	165	157	1,004
O. Goos	143	171	181	167	154	167	983
Rocklea Poultry Farm	176	189	174	164	139	135	977
Geo. Williams	179	182	147	162	148	148	965
C. A. Goos	158	173	133	170	148	162	944
Bathurst Poultry Farm	163	163	130	174	160	147	937
A. Neil	137	166	135	173	168	146	925
J. W. Short	158	144	156	151	168	140	917
Mrs. R. E. Hodge	146	153	147	163	157	140	906
A. C. G. Wenck	153	144	127	149	135	161	869
J. Purnell	147	146	148	141	160	137	879
H. Fraser	151	139	140	148	152	139	869
N. J. Nairn	148	113	148	135	132	136	812
Mrs. E. White	99	132	151	146	135	98	761

EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE—*continued.*

DETAILS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	198	191	171	163	256	151	1,130
W. Becker	188	191	196	182	179	164	1,100
Jas. Potter	167	198	173	174	172	202	1,086
Mrs. A. E. Gallagher	170	187	181	183	176	180	1,077
Jas. Ferguson	191	199	176	163	162	173	1,064
Jas. Hutton	179	166	170	163	158	158	994
Mrs. A. Kent	142	189	137	203	152	149	972
Parisian Poultry Farm	137	154	157	183	175	163	969
J. M. Manson	152	141	173	187	159	142	954
E. Walters	191	193	149	138	145	150	966
T. Hindley	163	176	178	168	145	132	962
E. F. Dennis	161	166	153	148	137	151	916
R. Holmes	134	133	156	148	166	174	911
H. M. Chaille	139	169	166	147	134	145	900
C. C. Dennis	151	166	117	150	145	145	874
J. H. Jones	156	154	142	130	119	154	855

FEEDING OF LIVE STOCK.*

By-Products of Sugar and Cotton.

Most valuable by-products from sugar-cane and cotton play an important part in the feeding of live stock. Molasses is of considerable value for the manufacture of huge quantities of alcohol and acetate of lime, materials used in the production of cordite, now so extensively used in warfare. It is its great worth as a food mixture for live stock with which the present article intends to deal. The boundary between summer and winter rains in Australia stretches from a point a few miles to the north of Carnarvon in Western Australia along a line striking across the Continent, in a south-easterly direction, and finishing near Eden in New South Wales. The line is somewhat irregular in New South Wales, over a great portion of which State uniform rains are experienced. Summer monsoonal rains occur over the nortern parts of Western Australia, the Northern Territory, and the northern portion of New South Wales, with the result that green grass is usually available in those parts for stock during the summer months. Southward of the line of demarcation between the two sets of rains, previously mentioned, summer downpours seldom occur, the main dependence of the agriculturists being upon the winter falls, which, as a rule, are of very regular occurrence. When a summer rain does occasionally happen along it is not looked upon with favour by many Southern farmers, who know that if the grass seed is encouraged to "shoot" too soon in the season there is every likelihood of the young grass being withered by the dry weather that supervenes.

Absence of Green Feed.

The absence of summer rains in Southern Australia means the non-appearance of green feed, except where irrigation plants are in operation, during the summer. This is the main reason why South Australia will never have the same opportunities of developing the dairying industry compared with Queensland. Continuous feeding on dry foodstuffs in summer has a bad effect on live stock in the South, and in drought periods many cattle die from what is known as "compaction," or "dry Bible," and even the death of sheep occurs at times from this complaint. Compaction results from a mass of dry food becoming lodged in the animal's stomach, and the absence of some succulent food to help carry it out of the system. The name "dry Bible" arose through masses of dry food having been found to have collected in that portion of a cow's stomach known as the "Bible"—similar to the leaves of a book, and post-mortem examinations showed that the lining of the stomach had perished, and pulverised easily when touched.

* "The Courier," Brisbane.

Heavy Losses from "Compaction."

Serious losses of cattle, particularly milch cows, have occurred in the past in Southern Australia during droughts, but since the reason of the deaths has become more widely known and preventive measures taken the number of deaths has been reduced considerably. Green feed not being available for mixture with the dry foodstuffs for the great majority of cattle the owners when trouble is threatened do the next best thing—mix molasses with the feeds. This by-product of sugar manufacture has been found of great service in preventing "compaction," and is easy to mix with the cattle feeds. Greater difficulty was experienced at first in feeding it to sheep in the grazing paddocks, but now the usual method is to mix the molasses with the sheep's drinking water. The molasses helps to break down the hard, fibrous nature of the dry food and bring it into a condition that enables it to be passed more readily through an animal's stomach. Where Queensland owners of cattle and sheep have been compelled to feed them on the leaves of trees, suitable for forage, in drought times they will find molasses of considerable service to them.

Cotton Seed Meal.

As the cotton-growing industry expands in Queensland it will be found that the oil-cake of cotton seed is a most valuable cattle-feeding substance. It has proved an excellent feed for dairy cows, giving particularly fine results when fed, with proper precautions, in the vast cotton-growing belts of country in the United States of America. The cotton bush is a drought-resister, and its leaves being relished by stock provide the owner with a valuable forage in dry periods. Care must be exercised at first in the feeding of cotton-seed meal to cows not used to it. A beginning should be made with not more than ¼ to ½ lb. per head per day, this quantity being gradually increased until 3 to 6 lb. has been reached. The meal is adulterated at times in America, and many dairymen insist upon the seller giving a guarantee that it contains from 41 to 46 per cent. of protein. Cotton-seed meal has a tendency to harden the butter, a matter of important consideration in hot climates. A test held in Kentucky disclosed that this meal when fed to cows kept on pasture gave a larger milk yield than when bran was used. Like results were obtained in similar experiments, but generally it was found that cotton-seed meal should not be given as the only grain ration, and should not be supplied in large quantities. A most effective ration is said to be 6 lb. of cotton-seed meal and 4 lb. of bran. The meal has also been found to increase the yield of milk when a proportion of maize meal has been added to the ration. Injurious results are believed to have arisen at times by supplying cows with cotton-seed meal by itself without mixing it with other feeding stuffs. In tests in New Jersey protein supplied by means of cotton-seed meal produced milk for 6d. less per 100 lb. and butter for 1½d. less per lb. than in the case of bran, or dried brewers' grains. Good results have been obtained from a mixture of meal and ensilage made of green maize. Excessive quantities of the meal, however, have a bad effect upon butter, and experiments have shown that it is better economy to feed 6 lb. per head daily than 7, 8, 9, or 10 lb. Occasionally cotton seed has been used in place of cotton-seed meal; but the butter in such cases has proved to be of better quality when the cotton seed was steamed than when it was fed either raw or roasted.

As wheat is produced in large quantities on the Darling Downs and in the Maranoa district, and as we have our flour mills in Brisbane and elsewhere, at which the bran is separated from the softer portion of the grain, it will be seen that Queenslanders are exceedingly well off as regards the provision of by-products—molasses, cotton-seed meal, and bran—for feeding to their live stock.

RAINFALL AT THE BRISBANE BOTANIC GARDENS.

The rainfall figures at the Brisbane Botanic Gardens for the last nine years are as follows:—

1915	24·76 inches.	1920	40·40 inches.
1916	50·58 inches.	1921	56·36 inches.
1917	40·05 inches.	1922	37·76 inches.
1918	23·81 inches.	1923	23·33 inches.
1919	21·28 inches.		

The average rainfall for Brisbane is 46 inches; and, as the rainfall at the Botanic Gardens for 1923 was only half that figure, the severity of the season of 1923 will be apparent.

SUGAR: FIELD REPORTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report, dated 22nd January, 1924, from Mr. A. P. Gibson, Acting Southern Field Assistant:—

Beenleigh.

Seasonal conditions have been extremely adverse at Beenleigh. Only 24 inches of rain were recorded from 1st January, 1923, to the end of November. Since November heavy rains have been frequent, and surface supplies of water have been replenished. Cane-growing is carried on in conjunction with mixed farming, and the small quantity grown on the scattered fertile areas is treated by a number of very small mills.

Mr. Heck has recently improved his factory, and before commencing the 1924 crushing he hopes to have 5 miles of a 2-ft. tram completed.

The principal variety grown is D. 1135. Q. 813 and H.Q. 285 should be given a trial, and the variety known as Purple Top (N.G. 64) should be discarded.

The cane here seems fairly free from pests and diseases. Grubs and *Pentedon australis* were located, but were causing little destruction.

The 1924 crop looked well, and should favourable conditions continue, more than double last year's tonnage will be harvested.

Mooloolah.

This district is situated on the North Coast Line, 54 miles from Brisbane, 11 miles from the Nambour sugar-mill, and about 90 miles from Mount Bauple. The residents consider they have land and water enough to raise a tonnage of cane sufficient to profitably run a mill of their own, and for this end they are striving.

It is obvious that to raise cane successfully and in quantity sufficient to run a mill, it is necessary to have (1) enough suitable soil; (2) freedom from frost; (3) a good annual distribution of rain, and other suitable climatic conditions.

From Landsborough to Woombye there are about 10,000 acres of land convenient to the North Coast line and suitable for canegrowing; of this total, 5,000 acres (1,500 of which are said to be highly situated) are located in the Mooloolah valley.

This valley extends from a point below Maleny on the coastal side of the Blackall Range. From a narrow glen it widens seaward into an extensive treeless plain. Not long ago this valley was clothed by dense vine scrub; now the soil is covered by a green mat of paspalum grass, with here and there small patches of cultivation. The soil is mostly alluvial, light to black in colour, and overlaying a clay subsoil at varying depths. It is composed of wash intermingled with disintegrated particles of sandstone, which is found outcropping on the surrounding heights.

Rainfall.—The monthly average record of rainfall here for nineteen years ending 1917, as compiled by Mr. Hunt on figures given by Mr. W. T. Paget, is interesting and speaks for itself:—

	Monthly Average for 19 years.	1923 Rainfall.
January	9·07	6·59
February	13·31	5·84
March	12·93	7·34
April	7·31	20·48
May	5·50	1·36
June	4·98	3·20
July	3·89	5·16
August	3·08	1·31
September	3·56	2·00
October	3·55	1·14
November	4·55	5·16
December	8·39	8·21
	80·12 inches	67·79 inches

The Eudlo valley, of similar formation and 3 miles distant, was also visited, but is not so extensive as Mooloolah valley.

These two valleys, including their lesser contributaries, possess much good soil not subject to severe frosts; healthy banana groves seemed to prove this.

Actual cane cut year 1922	200 tons
Actual cane cut year 1923	750 tons
Estimated to cut from over 100 acres planted, 1924 ..	2,000 tons

The average commercial cane sugar is said to be 12·5 per cent.

Mount Bauple.

This area looked promising, but the summer heat was rapidly drying up the cane fields, especially those that had been neglected.

The rainfall for 1923 was only 32·45 inches, 1·34 in. better than the preceding year. The district was highly favoured in December; some 5·57 inches of rain fell, which forced the 1924 crop along. Since then little rain has fallen, and owing to the substrata not having had a saturation for some time, it is obvious that this surface moisture will soon be lost, unless followed by further rains. Many farmers do not seem to realise the great importance of conserving ground moisture. This loss may be retarded by the timely use of surface mulching implements and green manuring. The former mentioned forms a protective layer of fine soil, which hinders the upward movement of water by capillary attraction to the surface, and is highly efficient in retaining water. Green manuring forming humus improves the water-retaining powers of soils and arrests the contraction and expansion of soil.

The principal variety grown is D. 1135, and of the many varieties tried none so far compare or are as suitable for the district as D. 1135. It is a common practice here to make cane drills with 5 ft. centres, and to plant the seed 3 ft. apart. The width of the row should be determined by the variety intended to be planted, fertility of soil, and a space that can be most conveniently cultivated. Accumulated experience points to close planting of seed in drills as being more profitable for the following reasons:—(1) It minimises the expense of supplying wants; (2) less land to keep clean; (3) reduction in evaporation by winds and sun; (4) a continuous wall of cane which helps to support a heavy crop during heavy winds; and (5) increased tonnage, which usually means more sugar per acre.

The factory, besides obtaining cane from the adjacent lands, draws a big proportion of its crop from outside areas, such as Pialba, Yerra, and other places situated along the North Coast line, a small supply even coming from Samford. Provision is being made to hasten transportation of cane over the Gundiah Range by placing a siding on the range top, thereby reducing the running time and increasing the loco. load to the mill yard.

Pialba.

The sugar lands of Pialba are close to the sea, and are consequently favoured by a satisfactory rainfall. These lands are undulating and are of a light, rather shallow scrub soil, formed in most cases by the disintegration of sedimentary rocks and extending back about 3 miles from the seashore. The principal variety grown and one at present giving satisfaction is the D. 1135. Some other varieties are being tried, and although looking well, are not considered equal to the D. 1135. M. 1900 should do well on some of these soils, but it is regarded as a shy ratooner. The age and time of cutting often influences ratooning.

The area under cane has increased very much in the last few years, owing partly to the failure of fruit. The crop looked healthy and was growing vigorously. Pests and diseases are not serious. A few grubs and moth borers were observed, the latter being more often found in dirty fields or near grassy headlands.

Cultivation might be improved. Growers who have cultivated judiciously have been rewarded; their crops possess a superior colour and are further advanced.

Present prospects are bright, and a big cut expected for 1924.

The Northern Field Assistant (Mr. E. H. Osborn) reports, under date 18th December, 1923:—

South Johnstone.

The dry conditions so evident elsewhere were also in force in this area, the total rainfall so far registering 70·29 inches. Despite such dry conditions, the estimated tonnage had gone up very considerably since the commencement of the season.

The cane crop in general was flourishing, both on the red soils and alluvial.

About 400 acres had been replanted, owing to a bad early strike.

El Arish (Soldiers' Settlement).

The rainfall amounted to 80·57 inches to date. Some good fields of cane were seen, more especially upon the reddish soils. Quite a lot of extra clearing had been done, and a fair acreage of planting had also been carried out. A heavy crop of cane should be cut in 1924.

El Arish is a very prosperous little township, and its accessibility to the larger towns by the opening of the North Coast line has increased its importance as a flourishing settlement.

Tully and Banyan.

The North Coast Railway is going ahead very rapidly, and settlement is increasing at a great rate.

Adjacent to the mill site clearing is being carried out, and early in the new year this area should be an exceedingly busy one.

A large area has been planted, mostly in August last. In many cases the planting has been upon open country, and ploughing was carried out with the aid of tractors, of which there are already four in the district.

The rainfall (Banyan Post Office) had amounted to 84·44 inches.

Near the mill site several "ranches" have been established, but the residents and the travelling public in general are hoping that another State hotel will be established and run upon the same efficient lines that make the Babinda Hotel so very popular. It is certain that the progress of this area in the very near future will make such an undertaking a necessity.

Cane Varieties.—In South Johnstone, El Arish, and the Tully, Badila is the principal cane grown, and certainly grows to great advantage in such soils. E.K. 28, H.Q. 458, and Tableland Badila in small quantities are also doing well.

Pests.—Very few grubs have shown up this season, and the same may be said of borers. Tachinid flies have been liberated in various parts of the South Johnstone area by the Meringa Experiment Station staff, with very successful results.

Babinda.

Although the rainfall locally amounted to 95·61 inches, it was a very long way below the average, but it was most surprising to see how very well the cane looked throughout all the large area, both plant and ratoons showing good growth. This was most noticeable in some of the more medium lands carrying a large proportion of granite grit, and which would be expected to show the effects of dry weather to a marked extent. Such, however, was not the case, and some heavy crops had been harvested upon these and also upon some of the low-lying and heavier clay soils. The resultant ratoons also looked so remarkably well in most cases that it was hard to realise how dry the conditions had been. Since the early part of the season the estimates have had to be increased considerably, and at time of writing the crushing was expected to run into the last week in January. The quality of the cane crushed has so far been very good; for instance, the mill average for the week ending 27th November was represented by 15·24 c.c.s. Some very heavy crushings had also been put through, and 16,500 tons of sugar sent away.

Varieties of Cane.—Apart from Badila there is a small proportion of the Gorus, D. 1135, H.Q. 426, and a much smaller percentage of newer canes, such as Q. 813, Tableland Badila, Q. 903, and E.K. 28. Of these, Q. 813 shows up the best in similar soil. Mr. T. Stewart, of Fig-tree Creek, cut a 10-months-old plant crop of this variety, going 25 tons per acre, for a density of 14 c.c.s., at a time when the mill average was only 13 c.c.s. He now has a 7-acre block of it, planted in August, and looking very green and vigorous.

Diseases.—Leaf scald was noticed in various scattered parts of the district, in N.G. 15 (Badila), H.Q. 426 (badly infected where seen), N.G. 24B (Green Goru), and in a few stools of B. 208. In young plant Badila odd leaves of it showed the leaf markings, but hardly any dead shoots were found, whilst in some 2nd, 3rd, and 4th ratoons recently cut and to be cut, a slight proportion were either withering up or were dead. In Green Goru, however, plant cane yet to be cut had the symptoms badly with dead tops in many places, and in several blocks of recently-planted cane odd shoots and sets were either dead or dying.

Whether dry weather conditions are responsible or not, it seems that "leaf scald" is more evident in this area than formerly, and the advisability of growers planting none but the very best seed cannot be emphasised too strongly, and this taken from a paddock that shows no symptoms of disease. Unless this is done, the chances are that this disease will gain a very strong hold, necessitating drastic steps later on.

Mulgrave.

The mill was handling its large crop with great efficiency. For the week ending 1st December some 6,044 tons of cane had been crushed.

The Northern Field Assistant (Mr. E. H. Osborn) report under date 28th January, 1924:—

Cairns.

The exceedingly dry conditions prevailing for so long in this area changed in the middle of December, when beneficial rain fell.

The crops, both young plant and young ratoons, were backward, and in very few cases had made cane. One of the most forward blocks was of May-planted Badila belonging to Mr. L. Walker, of Hambledon, which had been thoroughly ploughed many times and afterwards heavily dressed with filter press.

At Hambledon a block of E.K. 28 was inspected—August plant growing upon medium soil and owned by Mr. F. C. Curlewis. About 3 cwt. of mixed manure had been used, and it looked very well, having stooled vigorously and healthily. At Aloomba, Messrs. Carlson and Mann and Mrs. F. Morton have each small plots of this variety, comparing more than favourably with adjoining cane grown under exactly similar conditions.

At Gordonvale a very interesting time was spent with Mr. D. L. McBryde, the mill chemist, in his demonstration-of-diseases plot adjoining the mill. Here may be seen a large number of blanks, representing plants that either did not strike or died out after striking, and in other places healthy plants that had been inoculated with disease by being grown in close proximity to infected plants, and then died out. The plot is a most interesting one and well worth inspecting by every grower.

Grubs.—Very little grub damage was caused this season. Beetles had not, so far, been very numerous, but some "greybacks" were seen at Hambledon.

Mossman.

Crushing had just finished, and the rain came along exactly at the right time. Consequently a good deal of cultivation work was being carried out. There was also a certain amount of late planting going on, and a number of farmers were planting "supplies."

The past season had been a most satisfactory one. The quantity of cane dealt with—75,540 tons—was slightly ahead of the estimate, and the c.c.s. (15.07) was very good.

Mowbray.

Unfortunately this part of the Mossman area did not have as much rain as had recently fallen elsewhere, and consequently the recently-cut cane was backward. Some fair cane was, however, noticed on the farms of Messrs. Hardwick Bros., Robins, and Andreassen.

Diseases.—The district so far has been fairly immune from disease.

Manuring.—The practice of manuring is general.

The following particulars of cane varieties are interesting:—

Variety.	No. of Samples Taken.	Average c.c.s.
D. 1135	1,272	14.52
Badila	1,071	15.68
Clark's Seedling	952	15.78
B. 147	517	14.87
Goru	293	14.81
M.Q. 1 (Mowbray Seedling)	175	14.45
Black Innis	51	14.55
Q. 813	28	15.50
M. 189	26	14.78
B. 156	12	15.36
Malagache	5	14.45
Hybrid No. 1	4	15.80
Q. 903	3	13.30
Rappoe	2	16.84
M. 1900	2	16.41

Of above-mentioned canes, H.Q. 426 (Clark's Seedling), Badila, and Q. 813 show up well, being representative samples taken throughout the season. Rappoe, M. 1900, and Hybrid No. 1 are high, but were only in very small quantities.

Daintree River Area.

This area consists roughly of the Upper Daintree and the Lower Daintree North and South. The land in the Upper Daintree consists of rich alluvial flats upon one side of the river, with very steep spurs running to the water's edge upon the opposite bank. These spurs are heavily covered with either dense tropical scrub or forest. The flats under grass are carrying magnificent crops of *panicum muticum* or other grasses. The cattle seen upon these flats were in splendid condition, and dairymen of experience estimate that this land under artificial grasses will carry some 2½ to 3 beasts to the acre. The day of my visit some 100 head of butchers' cattle were being shifted to the tableland, and were a very good advertisement for the Daintree as a grazing proposition.

On the Lower Daintree there is a far larger and more accessible area that should be suitable for cane-growing, situated upon both the south and north sides of the river. It is mostly covered with thick vines and lawyer cane, and in the few places where landing was available, the soil was very fair and should grow good cane.

Inquiries were made from settlers of from 30 to 40 years' experience upon the river, as to the damage likely to accrue from floods, and it was stated that such water never remained up longer than from 24 to 36 hours, and naturally as the scrub is felled the water will be able to get away much more easily. In his report upon the Daintree lands, Mr. Surveyor Greensill estimates the approximate acreage of cane land as 1,800 acres on the Lower Daintree South, and 1,865 on the Lower Daintree North. One of the south-side settlers has already planted a small area for seed, which probably means the start of cane-growing on a large scale in this particular area.

Babinda.

Since my last visit bountiful rains had fallen. The cane had responded magnificently to the weather conditions. Running water was again to be seen in the creeks, and the pasturage looked a picture. The mill had crushed right through the Christmas holidays, and although the average c.c.s. had fallen, it was still 13.5 for the week ending 29th December, or an average for the whole season of 14.16. Some 20,000 tons of sugar had been manufactured to date, whilst the total quantity of cane harvested for the season was 163,000 tons. Generally the district was very prosperous.

TO PURIFY WATER IN A TANK.

An inquiry was received recently as to the best method of preventing the formation of green slime on well water that had been pumped into an iron tank. "The water is clear and fresh," wrote the correspondent, "and I wash the tank out frequently, but within a few days this green slimy stuff appears, and gets along inside the pipes, causing considerable trouble. Kindly advise if there is any uninjurious chemical, or what method I could adopt, to prevent the growth. The water is used for domestic purposes."

The writer was advised to clean out the tank and cover it so as to exclude the light. Simple aeration of the water in the tank by blowing air into it would tend to prevent the abundant development of the algæ (vegetable growths) with their objectionable tastes and smells. The following methods were suggested for chemical purification and elimination of algæ, &c.:—

1. Bleaching powder, used at the rate of 2 to 2½ ounces per 1,000 gallons of water. The chloride of lime should be mixed in a bucket with water, and the contents added to the water in the tank, and stirred through the mass.
2. Prepare a fairly strong solution of permanganate of potash in water. Add this in small quantities at a time to the water in the tank, stirring well after each addition until the bulk water acquires a very faint pink colour. The final depth of colour may be observed in a tumbler.
3. Copper sulphate (bluestone) is a highly effective algicide, and is extensively used in large water reservoirs, but the amounts used must be very accurately measured. It should be used at the rate of one part bluestone to six million parts water, or 12 grains (actually 11·7 per 1,000 gallons).

In using any of the above methods, two tanks may be employed, in one of which the purification process would be proceeding while the other was being used for any necessary purpose.—A. A. Ramsay, Chemist.—Ag. Gaz., N.S.W., January.

BREEDS OF PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

The first article of this series, "Classification of Pigs," was published in the November Journal. In the December number the points of the Berkshire were set out, and in the last issue the Tamworth breed was fully described. In succeeding issues other breeds of pigs and matters of moment to pig raisers generally will be discussed.—Ed. Q.A.J.

THE MIDDLE YORKSHIRE.

There are several breeds of pigs suited to the climatic conditions and environment of Queensland—the Berkshire, the Tamworth, the Poland-China, the Middle Yorkshire, and the more recently introduced type, the Duroc-Jersey.

There are also, of course, several crossbred types obtained as a result of mating two of these pure breeds together, such as the Tamworth and the Berkshire, &c.

To the young farmer who sets out with the idea of securing foundation stock for his future herd, several important points must therefore be kept in mind. Some of these might be dealt with as follows:—

First, he must consider his own fancy, for most men interested in pig-breeding have a fancy for one breed or another.

Secondly, consideration must be given to the public taste. This is a very important point, as the public represent the buyers, and in order to secure top market rates, we must aim at giving the buyer exactly what he requires.

Thirdly, he should not forget the live stock market demands. Some markets call for one type, some for another. The markets of the South call for a much heavier supply of light and medium weight porkers than the Queensland markets. Their types differ, too; thus in Victoria the most popular types are the Berkshire and the Middle Yorkshire, or a cross between these two breeds. These types being admirably adapted for the production of pork pigs and for the comparatively light bacon pigs, for which there is nowadays such a persistent demand, they suit the Southern markets rather better than the North. It is for this reason that types like the Berkshire, Tamworth, and Poland-China are more popular in Queensland than the famous Old Yorkshire, of which breed we have but one type now, popularly known as the Middle White or the Middle Yorkshire.

ORIGIN OF THE MIDDLE YORKSHIRE.

As far back as the year 1852, Joseph Tuley, a noted breeder of his day, exhibited at the English live stock shows a number of excellent quality white pigs. These were called Large Yorkshires, and were much admired. It was found that they were not altogether satisfactory, however, for they were inclined to grow too large and were, as a result, very coarse; so eventually a smaller type became more popular, and these were known as Small Yorkshires. These, after a wonderful run of popularity, also failed to "fill the bill," and thus it came about that as a result of continued crossing and careful selection another type was fixed, to which the title of Middle Yorkshires, Middle Whites, or Mid-Yorks was given. These have now, particularly in Australia, outgrown both the others in point of popularity with both pork-buyers and bacon-curers. Tuley was in reality one of the founders of this type, and he spent many years striving to make his favourites more perfect, both from a show as well as from a utility standpoint. Thus we have in the Middle York the medium between the short chubby nose and body of the Small Yorkshire and the rather elongated fine snout of the larger type. The short, broad face and the general symmetrical appearance of this breed make them a very attractive as well as a very useful type.

It is usually considered that the short chubby type of pig is much earlier maturing than those carrying a longer, pointed, and less-dished snout, and a more lengthy, fleshy body. This is one of the reasons why the Middle Yorkshire is so very popular as a pork pig. In England the breeders still have the three distinct types of Yorkshires—the Large York (essentially a bacon pig, and for crossing for bacon

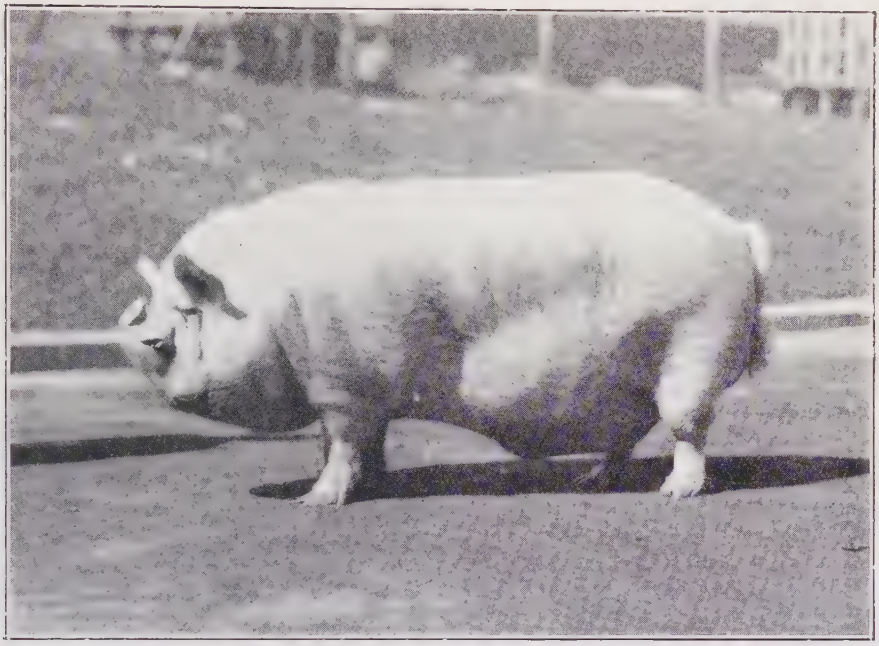


Plate 11.—Ralph Joyce's Champion Middle Yorkshire Boar, "Drayton's Chief, 1897."
Winner of Herd-book Ribbons for the Best Yorkshire Boar, Sydney Show, 1923.

Plate 12.—A Champion Middle Yorkshire Sow.
The property of Ralph Joyce, of Kyabram, Victoria.

production), the Middle York (a dual purpose animal suitable for either pork or bacon), and the Small York, which is distinctly a small, fancy trade porker suited only for Christmas or Easter markets. There are no Small Yorkshires in Australia at present; they are distinctly unsuitable for our climate, and we have no demand for the class they represent.

Of Large Yorkshires we have only a few, though this is a type for which there is a certain demand "down South." The Middle Yorkshire we have in very large numbers, and they are also a popular, attractive type, both in Great Britain and in other countries. In the United States of America they are classed as a secondary breed; they do not suit their conditions as well as some of their own white breeds, the Chester White, the Victorias, &c. They have therefore not been taken up very much by our "Yankee" friends, who prefer a "Made in America" breed.

One of the English writers (Harris, on the Pig) says of the Middle Yorks:—"They are perhaps the most useful and most popular of all the white breeds, as they unite in a striking degree the good qualities of the Large and the Small Yorkshires, and fortunately do not possess many of the inferior qualities of either of its progenitors.

"As a bacon pig, the type under review is well developed, and the lengthy sides enable it to produce more lean meat or meat of a 'streaky' nature. For the production of an ideal bacon pig they should be crossed with one of the other breeds, a large breed for preference (this for the English market). For porkers the best results are obtained by mating the Middle Yorkshire sow with the Berkshire or Poland-China boar."

In the pure-bred state the Mid York makes a very useful porker, particularly if well cared for and kept in clean sties or yards and well protected from the sun. They should be well washed and cleaned up before sent in to market if best prices are to be obtained. In the Southern markets they compare more than favourably with the Berkshires, &c. In general they resemble the Berkshire very much; they vie with the latter breed for first place as a medium type but must give way to the Poland-Chinas and Berkshires in districts subject to the extreme heat of summer, as the white pigs are more suited to the temperate parts of the State than to the tropical coastal districts. The Yorkshires cannot stand "sun baking," as their skin is ruined when once badly scalded or sunburnt. As an all-round farm pig for the cooler climates the Middle Yorks are a very fine type, noted for quick growth, early maturity, good feeding qualities, even proportion of fat and lean, with a comparatively light percentage of offal when slaughtered.

Several points worth careful note are as follows:—

(1) They are of a size, shape, and flesh that are desirable for the pork-buyer or bacon-curer's use.

(2) They have a hardy, vigorous constitution and a good coat of hair (if special attention is given to selecting a suitable type), which protects the skin.

(3) They have been spoken of as the gentlest race of pigs in existence, easily handled at all times, and kept in bounds with ordinary fences. They are also quiet and contented.

(4) They feed well and fatten quickly at any age.

(5) They are very prolific. Generally speaking, they are the most prolific and prepotent type we have. The young pigs are mostly even in colour and vary but little in shape. They are true to type and their form, when matured, may be determined by inspecting the sire and dam. They are considerably more prolific than the Small Yorks. Like all white types, they occasionally show blue or very dark spots on their pinkish skin.

Both pork-buyer and bacon-curer agree that the "Yorks," when well fed and cared for, produce a large amount of tasty, nutritious flesh with a minimum of light bone and offal. The flesh is evenly distributed. The sum of good qualities is higher than in most breeds. There is fully 10 per cent. or more difference in the meat value of a good, well-developed Yorkshire as against the common pig, of which we have a very large percentage. The latter types are usually deficient in vigour, constitution, and quality of flesh, whilst they are characteristically always hungry and squealing for more food.

SPECIAL ATTENTION IN SELECTING YORKSHIRES.

Special attention should be given in selecting boars and sows of this type in Queensland to ensure securing animals well provided with a thick coat of fine, silky hair, free from coarseness and black hairs. The very soft-skinned light-haired

Plate 13.—A Useful Quality Middle Yorkshire Boar.
One of W. J. Warburton's Winners, from the Northgate Stud.

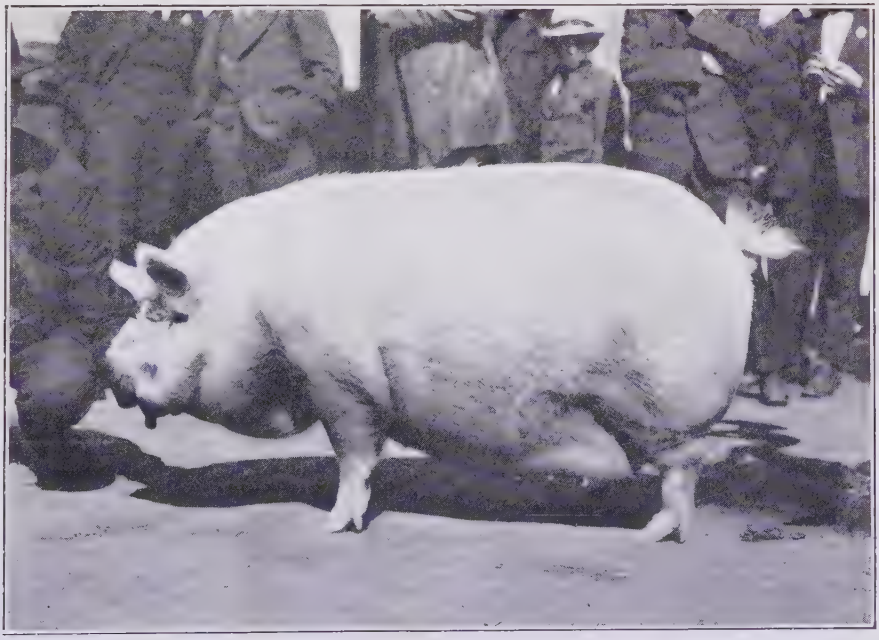


Plate 14.—A Typical Middle Yorkshire Sow.
She won First Prize with litter at foot, Sydney Show, 1923. Property of J. Winterbottom, Mascot, New South Wales.

types are quite unsuitable here. See also that they come from types noted for prolificacy. The Yorkshire sow is noted as an excellent mother, giving a good flow of rich milk.

In the Mid York the ham should be more fully developed than in most breeds. It has a great length at the rump, and the tail is usually well set up; the lengthy back, which may be slightly arched, carries a good depth of flesh, and this, connecting with the ham by a strong thick loin, induces a strong development of flesh in this most valuable cut.

OTHER CHARACTERISTICS.

The shoulders should be well set, deep and wide, allowing for the development of a roomy capacious chest, which is a very necessary feature. The neck should taper slightly towards the head. This is particularly noticeable in the female. The jowl is light, running well into the neck. The Yorks do not carry the heavy jowl and short thick neck characteristic of the Poland-China. The snout is short and dished, the muzzle broad and full, ears inclined to be large, though some types have short pricked ears. In the Middle Yorks the legs are usually well developed. This is a weakness in many strains of the larger type. The belly and flanks are deep and full fleshed, and the udders well developed. The sows are prolific, litters ranging from nine to thirteen being by no means uncommon. The "York" boar is usually a very sure stock-getter, and is both active and prepotent.

THE YORKSHIRE'S GREATEST FAULT.

Unfortunately the Yorkshire pigs possess the one great fault—they cannot stand the rougher conditions characteristic of many of our pig farms. They sun scald badly, and do not present the attractive appearance of other types that do not suffer from this defect. There is but one way to overcome this fault. The utmost care should be given in the first instance to selecting thick-haired types, and to providing abundant shade and shelter for the pigs at all times. Given these conditions, with improved methods of feeding and handling, there is no reason why the York should not prove a satisfactory type, though the writer would prefer to recommend the Tamworth, Berkshire, and Poland-Chinas, where fresh stock was being added to any stud.

DEATH OF PIGS FROM SALT OR BRINE POISONING.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

In the course of a visit to the North Coast districts recently, the writer reported on several outbreaks of disease in pigs.

In one case in particular it was found that the death of a number of pigs was due to their having consumed buttermilk into which an excess of churn washings, containing salt, had been emptied; this especially in cases where very young store pigs were being fed on this ration, and in cases where bacon pigs were in the final fattening stage and were given a full ration of this adulterated buttermilk (with the addition of a small quantity of bran and pollard).

On being analysed, two samples of the buttermilk were reported upon by the Agricultural Chemist, with the following result:—

ANALYSIS OF SAMPLES OF BUTTERMILK AS SUBMITTED.

	Sample "A" direct from Factory, and containing Buttermilk and Small Percentage of Washings.	Sample "B" from the Piggery where the trouble was experienced, and which evidently contained a heavy Percentage of Churn Washings.
Total solids	1093·4	1992·2
Loss on ignition	730·8	1259·6
Ash	362·6	732·6
Chlorine	134·4	259·0
Equivalent to common salt	221·7	427·3
Heavy metals	Nil	Nil
Arsenic	Nil	Nil

The following extracts have been taken from a special report on the above case by Mr. Veterinary Surgeon J. A. Rudd, of the Department of Agriculture and Stock, who also visited this property :—

> "The analysis of the buttermilk sent to the Agricultural Chemist showed excess of salt. Lately, owing to the scarcity of water, this farmer had been carting the butter washings, which doubtless contain a percentage of salt in excess of the requirements of the pigs, with the result that a number of pigs have succumbed, in all probability as a result of this excess of salt; but there are doubtless other reasons, such as, for instance, overcrowding, at times, in the fattening pen. The carrying capacity of a fattening pen is strictly limited and virtually depends, when room is a factor, on the weather. During the prevailing muggy weather pigs, after gorging on their food, will, if they are all crowded together, die, as the breeder described, very peacefully from heart failure.
>
> "Pigs which are fed on buttermilk should, if purchased outside, be very strong stores. Weaners do not do well on such food as a base for future development, for they naturally suffer in consequence, and any slight ailment is magnified into something serious, this depending, of course, on their condition, whether thrifty or otherwise. . . . .
>
> "I inspected the food tanks in which the buttermilk, &c., was stored, but found them clean. It was suggested that they be covered from the sun and the buttermilk fed as fresh as possible in order to prevent further loss . . ."

This case was one that had caused a good deal of speculation locally, for it had been suggested that the trouble was due to disinfectant solution finding its way into the buttermilk tanks. However, an analysis of the buttermilk proved the source of the trouble. It emphasises the necessity of buttermilk contractors being sure of the quality of this product. It is certain that considerable care is necessary in feeding buttermilk to pigs in order to ensure success. The value of this by-product of the dairy is too great to allow of careless methods of handling and feeding.

QUEENSLAND STOCK IN 1923.

Major A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

Abstracted from the Annual Report of the Under Secretary for Agriculture and Stock (Mr. Ernest G. E. Scriven) to the Minister (Hon. W. N. Gillies) for presentation to Parliament.

Stock Statistics.

The following figures supplied by the Government Statistician show a decrease on those for the previous year in the number of horses, cattle, and sheep, but an increase in the number of pigs is noted:—

Year.	Horses.	Cattle.	Sheep.	Pigs.
1922	747,543	7,047,370	18,402,399	145,083
1923	714,055	6,955,463	17,641,071	160,617

During the period under review drought conditions have prevailed over the greater portion of the State, the rainfall having been most sparsely distributed, and very patchy in character. The usual summer rainfall was not recorded in the Gulf country, which it is understood is unprecedented. At the latter end of 1922 the pastoral industry was feeling the effects of the drought very seriously, as in many districts no rain fell for the preceding ten months. The general depression in the cattle industry has continued, and cattle have realised very much less per head than was the case two or three years ago and generally are now almost unsaleable. This depression is largely due to the lack of oversea markets and the difficulty in the introduction of fat stock into the Southern States. The State and Federal authorities are now endeavouring to improve the industry by establishing oversea markets, and by generally improving the handling and carriage of meat.

The Marketing Problem.

An Australian Meat Council was formed nearly twelve months ago. Delegates were sent to the East, and their reports show the possibility of fresh markets being opened up. This, in conjunction with a reported shortage of beef and an increased demand in the Southern States, may possibly help the cattle-owners in this State.

Owing to the cattle-tick pest the Southern States impose such stringent regulations on the introduction of our live stock that stockowners are unable to take advantage of the much better Southern markets. It is considered that the three months' period of detention now enforced on our cattle on the Darling Downs or Western country could be considerably reduced even without detriment to the pastoral industry in the Southern States. It is contended that Queensland stock should be allowed introduction into New South Wales after the necessary dippings, in approved medicaments, under supervision, have been carried out in this State. The contention is supported by the fact that cattle from the tick-infested areas of New South Wales are permitted to be travelled to their clean country after dipping and found clean.

Sheep.

The sheep industry has maintained its prosperity, and high prices have been realised for wool and other sheep products. Owing to drought conditions, owners were forced to remove large numbers of sheep from Central Queensland to agistment country north of the Great Northern Railway. The lambing has been extremely irregular, corresponding to the patchy nature of the rainfall. In the Peak Downs and Springsure districts, and in areas west of Roma where rain fell, the lambing was normal, but in many districts there will be practically no increase. The blowfly pest has not been responsible for any serious losses, owing to the unfavourable season.

Stock Experiment Stations.

The Stock Experiment Stations at Yeerongpilly and Townsville have been actively engaged. At the former station 330 specimens were submitted for bacteriological and other examination, 69 stud cattle were made immune against tick fever, 8,910 doses of natural pleuro-pneumonia virus and 1,690 doses of the double blackleg vaccine were distributed in various centres. At the same station the agglutination blood-test was used on 78 suspected cases of contagious abortion, when positive reactions were obtained in 21 cases. Experiments conducted under the auspices of the Federal Institute of Science and Industry in connection with tick dip investigations, and extending over several months, were also carried out.

Work at the Townsville Experiment Station comprised the immunisation against tick fever of 34 head of cattle. Investigations were also conducted into an outbreak of so-called "impaction paralysis of cattle," which was fully reported in the May edition of the "Agricultural Journal." Analyses of dipping fluids and concentrates were made, and viscera and stomach contents examined. Attention is directed to the great enthusiasm displayed by the Inspector of Slaughter-houses, Townsville (Mr. J. A. Rheuben), who in the execution of his duties has, on at least two occasions, discovered parasites that hitherto were unrecorded in Australia.

Departmental Wool Scheme.

The Instructor in Sheep and Wool, in connection with the departmental wool scheme, reports that a larger number of farmers annually are forwarding their clips to the Department, for classification and sale. These small clips are received from all parts of the State. Some owners of wool have been forced to drop out of the scheme owing to the large increase in the number of their flocks, which exceeds the limit provided. Three hundred and sixty-nine bales were sold, comprising about eighty-one thousand pounds of wool. For merinos top price realised 27½d., the lowest price being 5d. for locks. The average price was 20½d. per lb. A new wool-room has been provided, which will be of considerable advantage from an economic aspect in handling the wool. The instructor and his assistant visited various centres and gave instructions to farmers on sheep matters in general.

Analytical Examinations.

Twenty-eight samples of viscera and contents were submitted to the Agricultural Chemist for analysis, and in fourteen cases poison was detected. In North Queensland four samples were examined, of which one contained poison.

Horses Exported.

Two thousand two hundred and ninety-eight horses were exported overseas, of which seven hundred and sixty-five were mares.

Examination of Stallions.

Examinations were held at the following places:—Nambour, Gatton, Rosewood, Brisbane, Sandgate, Laidley, Warwick, Goombungee, Murgon, Kingaroy, Toowoomba, Boonah, Mackay, Toogoolawah, Caboolture, Townsville, Crow's Nest, Beenleigh, Gympie, Clifton, Helidon, Ipswich, and Bundaberg.

Seventy-two stallions were examined, of which number nine, or 12·5 per cent., were rejected.

Dips and Dipping Fluids.

The total number of dips registered in the State is 4,240, as compared with 4,163 last year. Six hundred and forty-eight samples of dipping fluids and twenty-five dip concentrates were analysed. Of these 375 dipping fluids and 23 concentrates were dealt with in Southern and Central Queensland, and 273 dipping fluids and 2 concentrates in North Queensland.

Tick Board.

Owing to the prevailing drought and the poor condition of stock it was found impracticable to provide for regular musters and dippings in the cleansing areas. Straying stock on the various roads and reserves have been a grave menace to the tick-free areas, but the danger has been minimised owing to the fact that ticks have not been as numerous as they would have been under normal weather conditions. Although the regulations provide for at least two dippings and cleanliness of stock for clean areas, it has been found necessary in two cases to dip stock five consecutive times with an interval of seven days between each dipping before the cattle were clean. This is apparently due to the presence of accumulated dust in the base of the hair preventing the liquid gaining access to the skin.

Helidon Cleansing Area.

In consideration of the season the year's work has been very satisfactory. The previous year's figures in respect of inspections and dippings were slightly greater, except in the case of infested holdings, which show a slight decrease. Three infestations occurred in the Withcott area due to straying stock, but no further ticks were found after the first outbreak. The infested properties are quarantined until such time as thorough inspection can be made after rain has fallen. The officer in charge of this area states that large numbers of stock have strayed on to the various roads and reserves. These stock were in such poor condition that they could not be mustered, and the majority have since died, but the opinion has been expressed that they have done no damage to the cleansing area.

Holdings inspected	4,158
Stock inspected	160,704
Stock dipped	33,367
Infested holdings	288

South Burnett Cleansing Area.

Owing to the severity of the drought, extension of this area to include the parishes of Durong and Boondooma was not practicable. Stock in many cases had to be removed within the area for feed and water without enforcing the usual restrictions, but it is not anticipated that adverse consequences will ensue. A few holdings adjoining the tick-infested boundary were reported to be slightly tick-infested, but cannot be dealt with until the stock have regained their normal condition.

Holdings inspected	534
Stock inspected	48,268
Stock dipped	39,383
Infested holdings	73

Miles-Chinchilla Area.

With the exception of four sporadic outbreaks caused by the passage of travelling stock, this area has been free from tick-infestation. A close supervision of stock entering the area has been exercised by departmental officers, particularly on the Great Dividing Range, which forms the northern boundary. If this boundary is thoroughly supervised, and stockowners co-operate in this supervision, there is little likelihood of any serious reinfestments.

Holdings inspected	249
Stock inspected	19,939
Infested holdings	4

Diseases in Stock.

The Veterinary Staff made 370 visits to various centres in Southern and Central Queensland. (Appendix B deals with the work in North Queensland.) Pleuro-pneumonia contagiosa was the principal infectious disease which affected stock in this State during the year, but the number of outbreaks reported were only thirty as compared with seventy during the previous year.

Investigations made revealed the fact that in many cases the diseases were non-infectious.

The following diseases were recorded, viz.:—Tuberculosis, actinomycosis, abortion, influenza, anæmia, dropsy, debility, fungoid poisoning, phosphorus poisoning, arsenical poisoning, lantana and other vegetable poisoning, hoven, impaction, lymphangitis, malignant growths, meningitis, melanosis, neuritis, osteo-malacia, paraphymosis, pleurisy, pneumonia in calves, sterility, scour in calves, tick fever, traumatic pericarditis, urticaria, verminous bronchitis.

Tuberculosis.

During the year under review the tuberculin test was applied to 634 animals, as compared with 381 in 1922 and 280 in 1921. The number of positive reactions was 23, whilst 8 were doubtful, and will be retested.

Of the animals tested 188 were owned by Government departments, 372 privately owned, and 74 were subjected to the test prior to exportation.

Special veterinary attention has been given to the dairy cows in the Brisbane, Maryborough, and Bundaberg districts.

Eighty-nine dairies were visited, 2,791 cows examined, and 21 cows condemned as being diseased.

When cows were destroyed, a post-mortem examination was held in each case, confirming the diagnosis.

It is gratifying to note that the tuberculin test is becoming more popular. Stock-owners must realise sooner or later that it is expensive and unprofitable to retain diseased animals in their herds.

Administration of the Slaughtering Act.

The inspection duties carried out under this Act are steadily increasing. The figures for the year under review show a decided increase in the number of animals slaughtered generally for human consumption. In the metropolitan area alone there are no less than forty-one licensed slaughter-yards, at which, according to figures supplied to the Government Statistician for the year ended the 31st December, 1922, approximately 59,377 cattle, 25,248 calves, 320,860 sheep, and 15,273 pigs were treated.

As previously reported, it is impossible to make a thorough inspection where the number of slaughter-yards is so large, where supervision must be exercised, and until abattoirs are established the inspection must be more or less fragmentary.

The following are the comparative figures, compiled from the returns of the permanent officers of the Department:—

	1921.	1922.
Bullocks	79,268 ..	106,589
Cows	24,848 ..	33,750
Calves	27,018 ..	40,419
Sheep	465,731 ..	461,459
Pigs	21,977 ..	42,549

In addition, returns received from police officers of stock slaughtered for human consumption in 188 centres show the following comparative totals:—

	1921-2.	1922-3.
Bullocks	60,542 ..	63,135
Cows	28,648 ..	31,358
Calves	6,651 ..	5,079
Sheep	110,799 ..	91,577
Pigs	11,082 ..	15,360

In addition to the police supervision in country districts, the senior slaughtering inspector visited the following centres:—Dalby, Charleville, Roma, Toowoomba, Millmerran, Kooroongarra, Cecil Plains, Oakey, Cotton Vale, Thulimba, Stanthorpe, Gatton, Ipswich, Kalbar, Boonah, Toogoolawah, Linville, Rosewood, Lowood, Yarraman, Esk, Dayboro', Palmwoods, Nambour, Boowoogum, Kilkivan, Goomeri, Degilbo, Bundaberg, Gladstone, Rockhampton, Mackay, Finch Hatton, Proserpine, Bowen, Townsville, Ingham, Alpha, Emerald, Southport, Coolangatta. He reports a marked improvement in the general condition of butchers' premises in these districts, although in some instances a very unsatisfactory state of affairs prevailed as a result of the non-observation of sanitary conditions, which rendered necessary the service of an order on the licensee.

In the course of the year seventy new slaughter-houses were erected in various parts of the State; one was remodelled, and two are now under construction; and in conjunction with these slaughter-houses sixty-seven new shops have been established. A total outlay of £20,000 was involved by two individual owners in the erection of three shops and the installation of a refrigerating plant.

It is noted that in the transport of meat the motor is rapidly superseding the horse-drawn vehicle.

A central depôt for the inspection of carcasses of pork and veal has been established at this department. Since its inception in December, 3,912 carcasses of pork and 7,177 carcasses of veal were submitted for inspection.

APPOINTMENT OF COTTON ENTOMOLOGIST.

Commenting on a cable message from London, to the effect that Mr. E. Ballard, of the Bristol University, had been appointed by the Empire Cotton Growing Corporation as Cotton Entomologist to the Commonwealth, the Acting Premier and Secretary for Agriculture and Stock (Hon. W. N. Gillies) stated, in the course of a recent Press interview, that this is the outcome of action taken by him last year. Shortly after the Pan-Pacific Congress, held in Melbourne in August and September, 1923, Mr. Gillies had an interview with Dr. Butler, the distinguished English plant pathologist, who was attending the Congress, and Dr. Butler promised on his return to England to bring the matter of a cotton entomologist for Australia before the Empire Cotton Growing Corporation. This Corporation was established in 1921, and amongst its functions is to assist in the establishment and strengthening of the Agricultural Departments in the Dominions, and to provide facilities for training men in these Departments. At the same time Mr. Gillies cabled and wrote to the Agent-General in London (Hon. J. A. Fihelly), asking him to get in touch with the Empire Cotton Growing Corporation regarding the loan to Australia of a suitable entomologist with a special knowledge of parasites. A cablegram was received from the Agent-General last November, intimating that the Empire Cotton Growing Corporation had decided to appoint an entomologist to its own staff. They anticipated difficulty in finding a suitable man with the knowledge of parasites, but, if successful, the Agent-General intimated that it was reasonably certain that the Corporation would be willing for him to visit Australia to study entomological problems connected with cotton in Queensland and other parts of the Commonwealth. The message from London indicates that the Corporation has now been successful in securing the services of Mr. E. Ballard for a term of four years. He will remain an officer of the Corporation, but his services will be leased to the Commonwealth. A prior cablegram was received by the Director of Cotton Culture (Mr. G. Evans) to a similar effect, and immediately a message, strongly supported by Mr. Gillies, was sent to London recommending that the entomologist should make his headquarters in Queensland.

Mr. Ballard is 34 years of age, and was educated at St. Paul's and Conville and Caius College, Cambridge. He is a B.A. (Natural Science Tripos 1910). He was Government Entomologist for Nyasaland from 1911 to 1913. He then entered the Indian Agricultural Service, and was Government Entomologist in the Madras Presidency from January, 1914, till the present date, with the exception of the period when he was on active service in France and Italy. He was a commissioned officer of the Royal Field Artillery form 1916 to March, 1919.

Amongst published works by Mr. Ballard are: "List of Crop Pests of Nyasaland," "Two Pests of Mahogany in Nyasaland," "The Cotton Aphis," "Mango Hopper Control," "Investigations into the Bionomice of *Platyedra gossypiella* in South India," and many others.

In the course of his service in India he devoted special attention to cotton diseases, particularly to premature bud and boll fall.

ENTOMOLOGICAL NOTES.

JOHN L. FROGGATT, B.Sc., Entomologist.

Following the summer rains, we can expect a rapid growth of plant life. Coincident with this, however, an increase in the numbers of insects, both helpful and pernicious, must be expected. It is not possible to anticipate all the pests that may occur, but a few notes on those which are causing depredations to the crops and which are likely to continue for some time to come may be of help to all concerned.

These notes are compiled from reports by members of the entomological staff of field observations, supplemented in some cases with laboratory notes, and from specimens, &c., sent to the Entomological Branch.

MOTHS.

Cotton Pests.

The Cotton Worm (*Chloridea obsoleta*) is a dull-brown-coloured moth, which varies enormously in markings and colouration. The grub bores into the terminal shoots and bolls, in the first case causing the plant to throw out vegetative branches, and in the latter, devouring the developing lint. Fungus growths often enter through the openings made by the caterpillars and complete the destruction begun by the pest.

The larvæ, on emerging from the eggs, feed on the surface for only a short time, when they burrow into the plant or boll, and pass the remainder of the grub stage enclosed in the plant tissue.

Picking off and destroying bolls showing insect attack and dying terminal shoots will kill many caterpillars, thus reducing the numbers of the following generation of moths.

Several cases of maize having been used very successfully as a trap crop have been recorded. When the plants are in the silking stage, the corn is greatly preferred by this moth to the cotton, the eggs being laid in great numbers on the silks, thus at least reducing the number that can be laid on the cotton plants.

The Spotted Maize Moth (*Dichocrocis punctiferalis*).—This is a small yellow moth with black dots on the wings, arranged more or less symmetrically. The grub of this species causes similar damage to that of the cotton worm. Their larval habits are also similar and control methods must follow the same lines.

Where maize is used as a trap crop in either case, care must be taken to dispose of the plants before the larvæ are full grown, otherwise they will develop into moths right amongst the cotton, and aggravate the infestation it was designed to minimise.

The Rough Boll Worm (*Erias huegeli*).—This is an indigenous moth, the normal habit of the grub of which is to devour the wild hibiscus. It has developed and maintained the habit of infesting the cultivated cotton plants, a close relation of its native host plant. The damage done by this larva is similar to that done by the larvæ of the two previous species.

Destruction of infested bolls and shoots will greatly help to reduce the numbers in the later broods of the moths.

"Standover" and ratoon cotton, in addition to the native hibiscus plants, need to be very closely watched, as they will form ideal breeding centres to help carry the pest over the non-growing period. The great prolongation of the life cycle, more especially the pupal stage, is of further assistance in this connection. With eggs of this moth laid early in May, 1923, the life cycle was completed in from 79 to 85 days, the egg period occupying 6 to 7 days, the larval period 25 to 27 days, and the pupal period 48 to 51 days. The pupal period in April and May, 1923, extended from 16 to 22 days, while in January, 1924, it only occupied 11 days. It therefore would seem probable that the life cycle in the warmer months of the year does not occupy much, if any, more than three weeks.

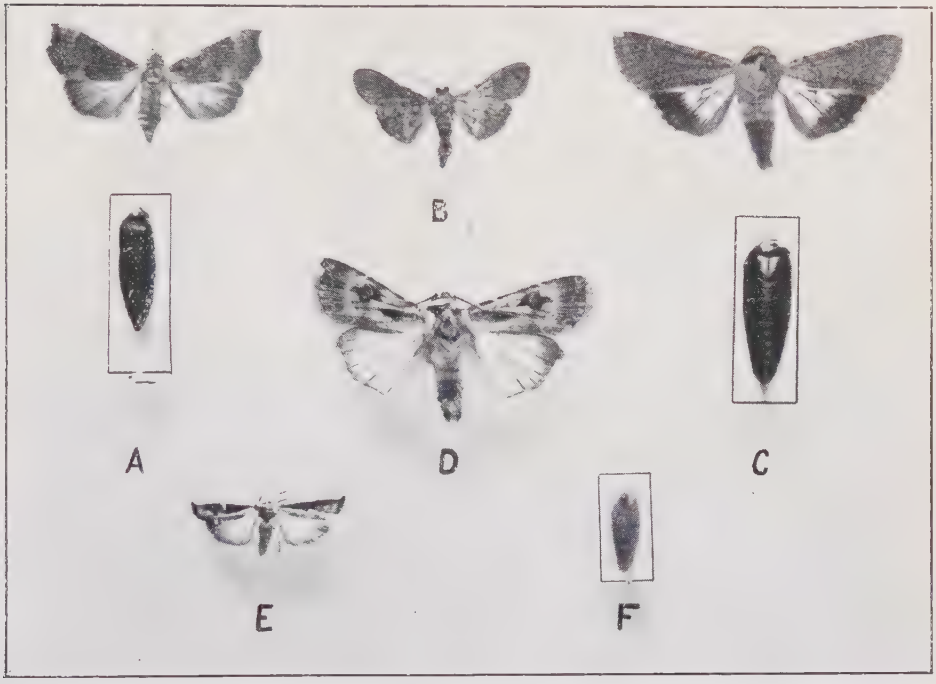
The Brown Cutworm (*Agrotis radians*) and *Neocleptria punctifera* have been associated in causing considerable devastation to young cotton plants.

Mr. F. G. Holdaway, B.Sc., of the Entomological Branch staff, dealt at length with these two Noctuid moths in the January number of this Journal.

Cosmophila xanthindyna.—This is a reddish-coloured moth, the larva of which feeds on the foliage. The larval period of this insect in June, 1923, was 11 to 27 days, and the pupal period 23 to 25 days. The life cycle is apparently about 6 to 7 weeks at that period of the year. One female moth in captivity laid sixty-five eggs.

There is another very tiny moth belonging to the genus *Bucculatrix*, the larva of which in its early stages mines into the tissue of the leaves and may cause a great loss of foliage to the plants.

Leaf-eating caterpillars may be destroyed by an effective dusting or spraying with arsenate of lead. If the former method is used, the poison should be mixed with three parts of finely slacked lime or wood ashes, and be blown over the plant.



THE COTTON MOTHS.

A. *Cosmophila xanthindyna*, Moth and Chrysalis.
B. *Dichocrocis punctiferalis*, Moth.
C. *Chloridea obsoleta*, Moth and Chrysalis.
D. *Agrotis radians*, Moth.
E. *Earias huegeli*, Moth.
F. *Earias huegeli*, Cocoon.

(All natural size.)

PLANT-EATING BEETLES.

Several chrysomelid beetles have been found feeding on cotton, two of which have been very destructive.

1. *The Rose Beetle* (*Monolepta rosea*).—This is a well-known pest of cotton.

2. *Rhyparida australis*—a species new to cotton in Queensland. Observations on this pest will be dealt with at greater length in a separate article by Mr. J. H. Simmonds, B.Sc., of the Entomological Branch staff.

The beetles feed on the foliage, buds, shoots, &c., often causing them to wither and fall off, checking the growth of the plant, and when they are small, often bringing about their complete destruction.

M. rosea was found also to be eating the bracts round young bolls, as a result of which they withered and died.

The native host plants, as also the life histories of these beetles, are not known.

The only methods of control possible are aimed at the destruction of the adult insects as soon as they appear in the crop.

Light flares made by tying pieces of kerosene-soaked bagging on to sticks, which are lit and carried through the infested field at night, attract considerable numbers of the beetles, with the result that they are scorched and die.

Another means that can be used advantageously is to make a shallow tin tray, *e.g.*, by turning up the edges of a sheet of galvanised iron, and fit an attachment on to one or both ends, by which it can be drawn along. It can be made of such a width as to be available for two rows of cotton at once. Pour in water and kerosene, or a light oil. As it is pulled through the field the bushes are shaken over the tray, causing the beetles to fall, when they are caught in the liquid and killed. This is known as the "Hopperdozzer" method.

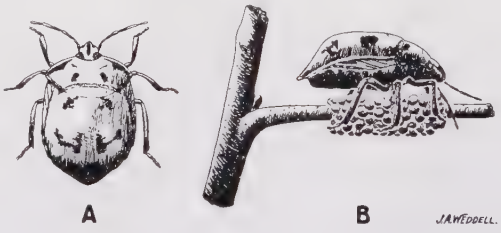
PLANT BUGS.

Several species of plant bugs are known to frequent cotton, in some cases doing damage of a serious nature.

1. *The Rutherglen Bug* (*Nysius vinitor*) is a small black insect with shiny wings.

2. *The Coon Bug* (*Oxycarenus luctuosus*) is similar to the former species, but has slight black markings on the wings. In the early stages of development it is bright red in colour.

3. *The Chinese Bug* (*Tectacoris banksii*) is a very brightly coloured insect with markings resembling Eastern lettering on its back. It lays its pink eggs in clusters around leaf stalks and twigs on the plants. When the young ones emerge they cling more or less in clusters on the under surface of the leaves for a time. By removing the eggs masses and leaves carrying the young bugs and burning them, very large numbers can be destroyed.



THE CHINESE BUG (*Tectacoris banksii*).

A. Dorsal View of Adult.
B. Female resting on egg mass.
(Natural size.)

4 and 5. The two cotton-stainers (*Dysdercus sidæ* and *Homioceris* sp.) discolour the lint by clambering over the opening bolls and soiling the fibre with their excreta, &c.

The first two species could be destroyed in large numbers by employing the "Hopperdozzer" method in the evening or very early in the morning while the insects are inactive.

All these bugs feed on the sap of the plant, which they obtain by puncturing the bark with their sharp-pointed trunk. Where they are present in numbers, they may often cause the portions attacked to wither and die.

THE COTTON STAINER.
(*Dysdercus sidæ.*)
(Natural size.)

LOCUSTS ("GRASSHOPPERS.")

The common plague locust (*Chortoicetes terminifera*), whenever it occurs in numbers, eats everything green before it. When it attacks cotton while the plants are young, it may cause sufficient destruction to kill them.

The eggs of "grasshoppers" are laid in the ground, and the young, when newly emerged, remain on, or near, the breeding ground for several days before they begin to spread out. In this stage spraying with arsenic solution (1 lb. to 16 gallons of water) will destroy the young hoppers in hordes. Later on the only means is to lay out poison baits composed of bran, green chopped lucerne, &c., wetted with a solution of arsenic of a strength of 4 oz. to 5 gallons. The addition of a little molasses to the poison liquid just before applying it to the bait may render it more attractive to the insects.

TERMITES ("WHITE ANTS.")

These have occasioned slight damage by destroying the roots and boring into the stem of the plant from below ground. Should this damage become serious, treatment of the soil with paradichlorbenzole should tend to keep them away. This chemical would need to be buried in the soil 3 to 4 inches below the surface along the rows close to the base of the plants.

Maize.

Chloridea obsoleta and *Dichocrocis punctiferalis* have been met with on corn, the former rather preferring the cobs and the latter breeding in the cobs, stems, and terminal shoots, and in some cases was far more numerous than the first-mentioned species.

Although this crop has previously only been referred to as a trap crop for *C. obsoleta*, it may prove just as valuable a one for *D. punctiferalis* also.

Tomatoes.

Isodon puncticollis is a small brown beetle, in length slightly greater than in width. It has been destroying the plants by eating the roots.

Treatment of the soil with paradichlorbenzole should keep these insects away.

The tomato moth (*Chloridea obsoleta*) has been already referred to.

Fruit Flies.

The Queensland Fruit Fly (*Chaetodacus tryoni*) and the *Tomato Fly* (*Lonchea splendida*) have both been bred from the fruit.

Chillies.

Fruit Flies.—The Solanum Fly (*Chaetodacus tryoni* var. *solanum*) and *Lonchea splendida* have been bred from chillies. They have completely destroyed the late crop in some localities.

Fig Trees.

The Chrysomelid Beetle (*Galleruca semipullata*) in the larval state has caused considerable damage to the foliage of the trees. Where the fruit is not too near to ripening, a thorough spraying with arsenate of lead or "paris green" should destroy these small black grubs. Otherwise hand-picking and destruction of the infested leaves will have to be resorted to.

A Cerambycid (*Longicorn*) (*Monohammus mixtus*) has been reported to be destroying the young fruit.

Beans.

The Bean Fly (*Agromyza phaseoli*) has been sent in from a number of localities. The eggs are deposited in the plant and the maggots tunnel into the stem and destroy the tissue, causing the plant to wither and die.

No treatment has so far been found to be effective for this pest.

In order that a thorough knowledge of the insect pests may be obtained, it is requested that specimens of all such met with be forwarded to the Entomological Branch, Brisbane, with information on the locality found and damage caused. It is only in this way that most necessary measures can be worked out for preventing devestation by these pests.

THE MAIN ROADS BOARD.

A YEAR'S ACTIVITIES.

In the Second Annual Report of the Main Roads Board there is much valuable material well worth the study of all interested in the vigorous development of the State. The march of the motor vehicle compels greater attention to the facilitation of inland transport and to all that good roads mean to inland dwellers.

It requires no particularly lively imagination to picture the Queensland countryside of the future with its well made and maintained roadways radiating from every town centre—roadways that will not only be feeders to the railways, but also well used traffic lines for horse and motor transport in inter-town and inter-district commerce.

The flow of petrol in ever-increasing volume must have a natural corollary in good roads from the areas of production to the centres of distribution. Motorised delivery has already become a new factor in agricultural progress.

To any community a good road is a new opportunity—a means of improving in many ways the economic and social status of the town and district.

In Queensland in recent years there has been a slow but certain development of roadway construction from a casual activity in the hands of untrained men without programme or plan, other than to maintain a minimum of convenience and facility for ordinary traffic, towards a reasoned industry in the hands of competent engineers, supplemented by intelligent local help. This is part of the forward Government policy of making country life more attractive, and its aim is to provide in rural districts complete and economical traffic service. The Main Roads Board is a medium through which much substantial progress is expected, and the following notes taken from its Second Annual Report, together with plates illustrating its activities, convey an idea of the scope and importance of its work:—

Construction.

Works are commenced after approval of the plans by the Board and Councils, and upon authority being given by the Governor in Council.

In general, the supervision is placed in the hands of the Local Authority, which engages the labour, and if necessary arranges with the Board for the supply of plant.

Frequent inspections of the works are made by the Board's officers, and the Local Authority officers are required to submit cost sheets indicating the progress of works and comparison of actual and estimated costs once a month.

It is regretted that some difficulty has existed in obtaining this very necessary cost data from some Shires, and it is a very noticeable fact that those Shires which have complied with the Board's requests on the matter have carried out their works more cheaply and effectively than those not so doing.

The regular comparison of actual and estimated costs on any work is essential to its economical conclusion, and quickly indicates where improvement in method of working may be possible.

The problem of the economical handling of material, especially in the haulage of metal or gravel, is of the greatest importance and requires close study by the Engineers in charge of the various works.

Broadly speaking, it is more economical to use large drays of from $1\frac{1}{4}$ to 2 cubic yards capacity for haulage of gravel or metal on leads up to 1 mile. For longer leads, the motor truck or wagon is more economical provided the track is good enough. For still longer leads the traction engine and 5-ton trailers are cheapest, always provided that fuel and suitable water are available, and that the ground is not boggy.

Plate 15.—Brisbane-Ipswich Road (near Goodna).
State of road when taken over by Main Roads Board. The gap shows site of burned-out bridge.

Plate 16.—Brisbane-Ipswich Road (near Goodna).
Regrading and metalling and replacement of burned-out bridge by fenced embankment and reinforced concrete culvert.

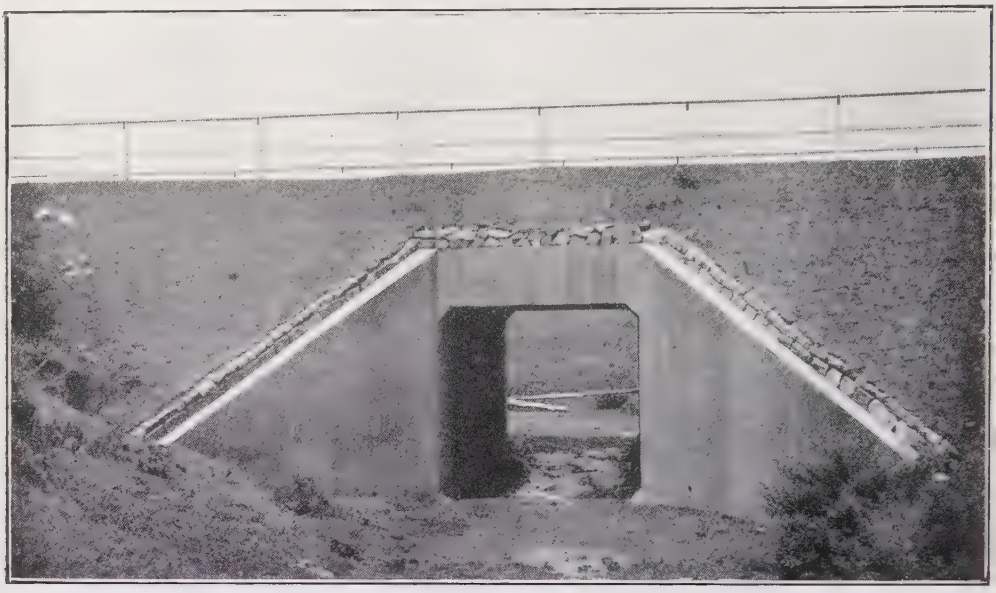


PLATE 17.—REINFORCED CONCRETE CULVERT REPLACING BURNED BRIDGE.
Showing reinforced concrete culvert, 10 feet by 10 feet, at site of burned bridge. The bridge was 40 feet in length.

PLATE 18.—DARLING DOWNS. ROAD ON BLACK SOIL NEWLY CONSTRUCTED BY SHIRE COUNCIL AT A COST OF ABOUT £15 PER CHAIN.

PLATE 19.—DARLING DOWNS.
Same road, indicating the necessity for bringing about "Weight of Load Regulations," and the absolute waste in constructing roads of inferior material and insufficient thickness to carry heavy traffic in black soil.

PLATE 20.—COOROY-TEWANTIN ROAD.
Showing completed gravelling.

The transportation of crushed stone from fixed quarries either direct to the road bed or to railway trucks is most cheaply effected by light tramways and side-tipping trucks, provided that the quantity of metal to be supplied from the fixed plant is large enough to keep the equipment charges per cubic yard of metal at a low figure. The tramway may often be arranged so that the trucks run by gravity to the dumping point and are hauled back by a light petrol locomotive. The ingenuity of Engineer Kennedy, acting on behalf of the Shire Engineer for Landsborough (Mr. A. E. Harding Frew, B.E.) has solved the problem of using motor bicycle engines of up to 8 h.p. mounted on truck frames for this purpose.

The problem of the foundation or lower course of a road with a macadam top course requires very careful study. In general, gravels, sandstones, or ironstones may be obtained locally and may be hand broken and rolled solid much more cheaply than the hard crushed stone which is to form the top course, yet it has been observed by the Board on occasion that merely for the purpose of keeping a crushing plant going, expensive crushed stone has been used for this purpose when the extra money involved could have been much more usefully employed in extending the mileage of work.

After careful consideration of the standards laid down in the First Annual Report for thickness, width and classes of materials required in the construction of macadam and gravel roads, and taking into consideration traffic, climatic, and soil conditions, the Board is unhesitatingly of opinion that any reduction in standard thickness would be most unwise.

Roads on the Downs.

The fact that heavily trafficked roads on the bad black soil foundation of the Darling Downs cost, when built to the Board's standards, as much as £5,460 per mile for 16 feet of macadam and for 12 feet £3,140, has been used as an argument for the construction of an inferior road, but the Board has direct evidence that such an inferior road, costing from £15 to £18 per chain or £1,200 per mile, has been practically destroyed within eighteen months of its construction, as the accompanying photographs will show. The asset value at the end of two years is certainly not more than £400 per mile, or a total loss of £400 per annum per mile, and all this with a most inferior road available for traffic.

Now £400 per annum would provide funds to the Local Authority for the construction of a road costing £11,430 per mile under the Main Roads Act, or more than double the heaviest actual cost per mile incurred on the Downs.

Mountain Roads.

In the case of mountain roads carrying a large volume of heavy traffic, it is essential both that the grade shall be easy and the surface smooth, hard, and thick enough to prevent heavily-loaded wheels from breaking through.

The Landsborough-Maleny road is a case in point. The old road gradients were about 1 in 8 and the surface so deeply rutted as to be almost impassable after rain. The new road under construction has no grade steeper than 1 in 18, and generally much easier. The new location is everywhere no further from the old than a quarter of a mile. It is properly drained and metalled to a minimum width of 12 feet (widened to 15 feet on the inside of curves which are super-elevated). The foundation consists of consolidated thickness of 6 inches of local sandstone which has set like a concrete. This is capped by a wearing surface having a consolidated thickness of 6-inches of crushed basalt bound with screenings and stone dust.

A road built on a steeper gradient would be most expensive to maintain, and if a lesser thickness of road crust had been adopted would, owing to the poor subgrade condition, quickly break through and be destroyed.

The old so-called road has been costing the Council £1,600 per annum for maintaining in its present awful condition.

Plate 21.—First Section of the Atherton to Yungaburra Road.

Plate 22.—Cairns Tableland Road, Little Mulgrave Section.

PLATE 23.—TAMBOURINE MOUNTAIN ROAD, ROCK WALLING.

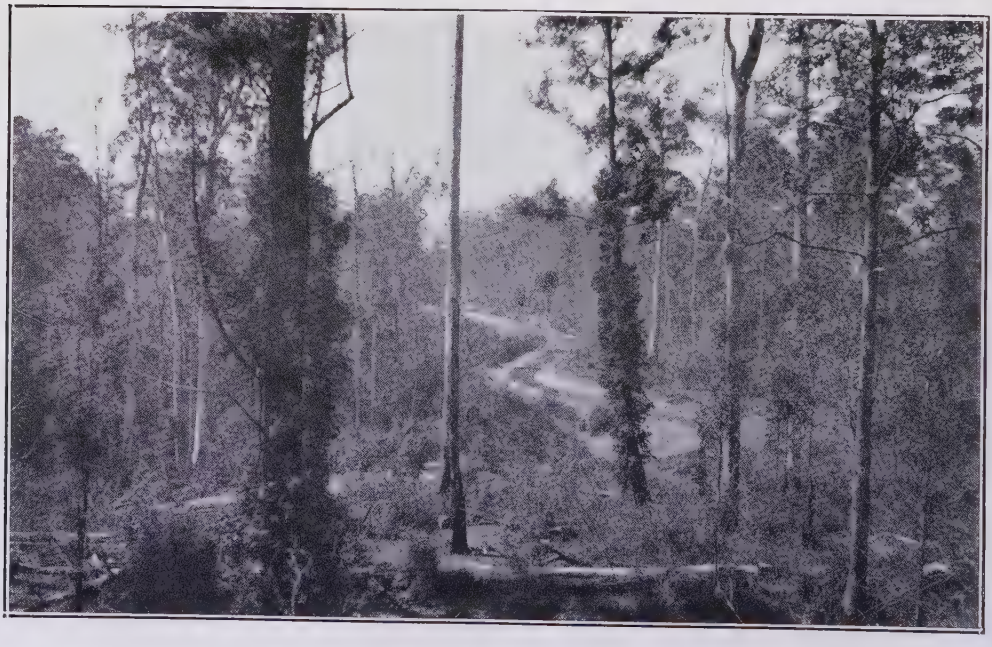


PLATE 24.—LANDSBOROUGH-MALENY ROAD, SHOWING COMPLETED METALLING.

Plate 25.—Section of Commonwealth Grant Work.

Plate 26.—Ridgelands-Yaamba Road.

If we assume that £1,400 of this amount be earmarked for repayment of interest and redemption, then the first £40,000 expended on the new road will be provided for and the maintenance can be dealt with by the expenditure of £200 per annum by the Council and £200 by the Board without the road costing the ratepayers one shilling more than they are paying for the present imitation of a road.

The two cases quoted have been chosen as they represent instances of roads of heaviest cost.

Low Cost Construction.

As an instance of low cost it may be stated that excellent gravelling work has been carried out on the Southport road, in Coomera and Beenleigh Shires, at a minimum cost per mile of £230, and an average of £450. The gravel in this instance was obtained locally on short leads and hauled in a steam wagon, motor trucks, or horse-drawn vehicles, and was watered before rolling with a steam wagon, the front wheels of which were removed and a roller substituted for the purpose. A profile board and spirit level were used to ensure that the shape of the road was correctly maintained.

A much better road has been constructed than it was possible for the Local Authorities under the old conditions to build at anything approaching the same cost.

A Californian Comparison.

The seventh biennial report of the Californian State Highway Commission of December, 1920, page 111, indicates that the average cost of a mountain road (earthwork and retaining walls only) in Mendocino County, constructed by convict labour, was 16,271 dollars per mile, exclusive of bridges, notwithstanding that machine drills and steam shovels were freely used. On page 139 of the same report the following are costs of grading taken at random:—

	Miles.	Dollars.
Humbold County	4·95	12,998
	6·86	71,668
Imperial County	5·84	43,686
Los Angeles	12·84	146,922
	1·04	3,506
Siskiyou	4·50	42,632
	36·03	321,412

Indicating that 36·03 miles cost 321,412 dollars; or an average cost of £2,051 per mile for grading only, prior to surfacing with gravel, concrete, or macadam.

This is the best possible evidence that other countries will not tolerate inferior road work even though the cost of good work be high.

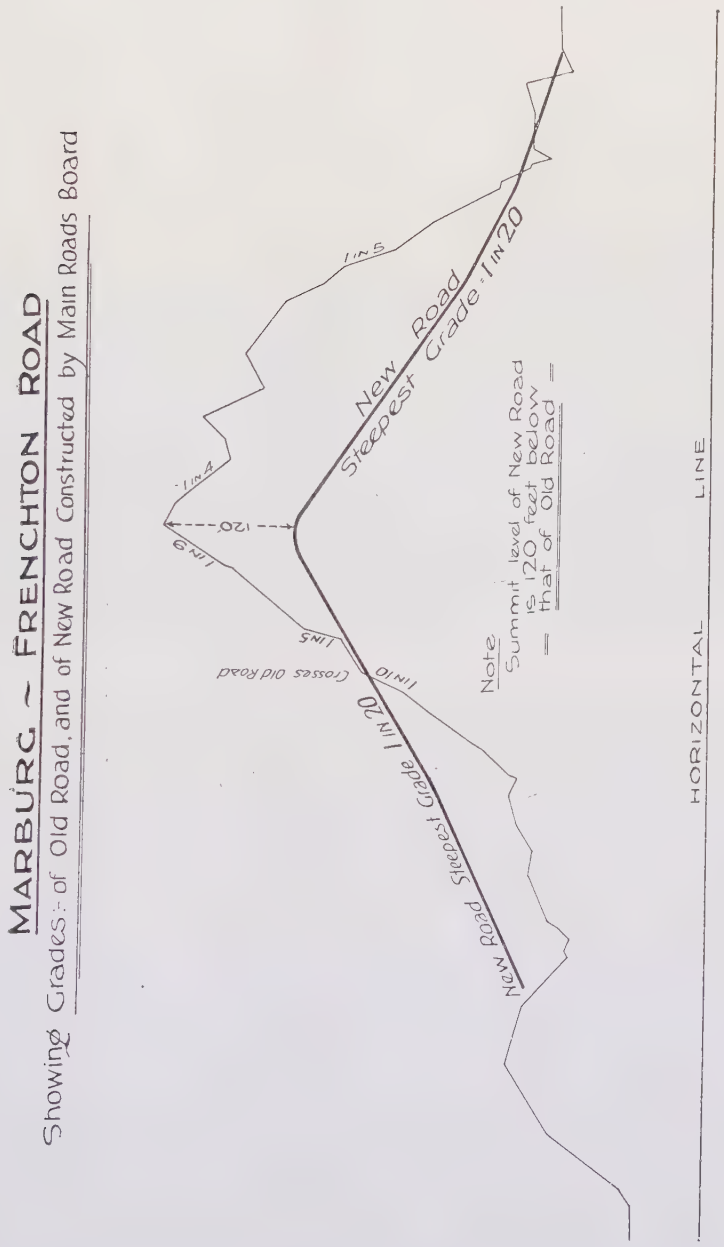
Surface Treatment.

Certain main roads which carry, or will carry, a large proportion of motor traffic, require special surface treatment in order to prevent unravelling of the macadam. In general, only a surface spraying with distilled tar or bitumen, covered lightly with coarse sand, gravel, or stone screenings, will be necessary in these cases.

One section of the Ipswich road, near Goodna, has been so treated with excellent results and it is proposed to so protect the surface of the work in progress between Bullock Head Creek and the railway crossing overbridge at Dingo Hill, on the boundary of Moreton and Sherwood Shires. The Anzac Memorial road now under construction between Petrie and Redcliffe will be protected in a similar manner.

A comparison between the original Marburg-Frenchton road and that recently completed by the Board is illustrated. Grades have been very greatly improved—the steepest on the old road being 1 in 4, while the new road has no grade steeper than 1 in 20. This means a reduction in haulage cost per mile in the ratio of 2 is to 7, and is an illustration of the value of scientific location.

In addition, the new road crosses the range at a point 120 feet lower than the old, and on this account alone there will be a saving of at least half a million foot tons of energy per annum—that is, the energy required to lift 500,000 through a height of 1 foot.


MARBURG - FRENCHTON ROAD
Showing Grades of Old Road, and of New Road Constructed by Main Roads Board
1 IN 5
1 IN 4
120
1 IN 9
1 IN 5
Crosses old road
1 IN 10
New Road Steepest Grade 1 IN 20
New Road Steepest Grade 1 IN 20
Note
Summit level of New Road is 120 feet below = that of Old Road =
HORIZONTAL LINE

It is necessary to correct the impression which has gained ground that when a road is gazetted the Board will proceed to macadamise it throughout.

Gravelling or macadamising is only undertaken where necessary, and many sections of road will be merely cleared and drained, whilst other sections may only be lightly formed with the local material.

Special care is being taken to ensure that wherever possible existing road foundation shall be incorporated as part of necessary new work.

The Board has noted with considerable satisfaction that a number of Shire Councils in their endeavour to economically and effectively handle Main Roads works have employed either permanent or consulting engineers, and the results in most cases have been very beneficial.

PLATE 27.—MAINTENANCE WORK ON A MOUNTAIN ROAD.

The Board is in communication with the Commissioner for Railways in order to avoid unnecessary competition between Main Roads and railways. It is the Board's policy not to recommend the declaration of any road as a Main Road which would be likely to interfere with railway traffic earnings. In the cases, however, of the Brisbane-Ipswich road, and the Cairns-Tableland road, there are special circumstances existing; in the former case the road is an inter-communication route, between two large cities, and in the latter between a large producing area at an elevation of 2,500 feet, and its port of shipment at present having no road communication with the coast.

TOMATO MOTH.

The caterpillar of the Tomato Moth frequently causes very serious loss to tomato-growers in different parts of the State. It is always present in one part or another of the tomato-growing districts of Queensland, and unfortunately it is a somewhat omniverous feeder, attacking cotton, maize, peas, beans, potatoes, tobacco, and other plants. Mr. Benson therefore recommends all tomato-growers and others whose crops suffer from the ravages of this pest to take the following precautionary control measures:—Dealing especially with tomatoes, this pest lays its eggs on various parts of the plant, and the caterpillars when first hatched feed on the leaves, flowers, or the young shoots, or they may burrow directly into the fruit. Spraying the plants with a mixture of Bordeaux mixture and arsenate of lead, using 3 to 4 lb. of the latter to 100 gallons of the bordeaux mixture, will be found an effectual remedy if applied as soon as the young caterpillars are hatched out, as they will probably consume a portion of the poison and thus be destroyed. In addition to the spraying, all fruit that shows any trace of moth should be gathered and boiled, for, if allowed to lie about on the ground, it only increases the number of moths. Where a crop is very badly infested it is desirable to destroy both the haulms and fruit and to break up the land, as by doing so most of the pupæ that are in the ground will be destroyed.—A. H. BENSON, M.R.A.C., Director of Fruit Culture.

THE PINEAPPLE INDUSTRY OF HAWAII.

By Major DANIEL E. EVANS, D.S.O., M.I.E.S., M.I.M.E.

The following notes by Major Evans, who is well known in Brisbane business and professional circles, were made in the course of a recent visit to the Hawaiian Islands, and will be read with much interest by Queensland pineapple-growers. They cover experimental activities, methods of cultivation, and economical treatment of the product; also, the manufacture of by-products and the use of paper of local manufacture for mulching purposes.—Ed.

I was much impressed with the large production of the pineapple in the Hawaiian Islands and the care taken in the selection of seed plants and cultivation. Last season 6,000,000 cases of canned pineapples were exported from the Islands. As may be expected, considerable experimental work was necessary to work up such a large industry. Until recently, the pineapple experiment station existed as a department of the Hawaiian Sugar Planters' Association experiment station, but it was found that this relationship was inadequate, and a decision was made to acquire a piece of land and go more extensively into experimental work with pineapples.

The separation of the pineapple experiment station from the sugar experiment station took place at the beginning of 1923, and it was about this time that work was begun on the new station at Wahiawa, and as soon as the plant had progressed far enough the pineapple people moved into their new quarters.

The station consists of one office building, three glass houses, one lath house, one combined warehouse, store-room and implement shed, one stable, three houses for labourers, and two residences for members of the staff.

All buildings are one story wooden structures, and, with the exception of the two residences, all are painted dark green with white trimmings. The residences are painted dark red, with light red trimmings.

The largest of these buildings is the lath house, which is about 50 feet by 110 feet. This building is said to be already too small, and it is planned to enlarge it next year.

The glass houses are each 18 feet by 40 feet. At present the station has 60 acres of land, half of which is being planted this year. The rest will be planted next year. In 1925 another 40 acres of land will be available, making a grand total of 100 acres.

The Cayenne Variety.

The head of the experiment station is said to have stated that the Cayenne is the best commercial variety of pineapple. The Cayenne pineapple was first grown in the hot houses of England, where it was tended with the greatest of care. It is said to be produced commercially in only a few parts of the world, Hawaii being the most outstanding. The station staff are of the opinion that better strains of this variety may be selected and developed, but a better variety can not be had.

It has been observed that some pineapples use up much of their strength in throwing sprouts, while others throw a very fine commercial fruit. Naturally the former has higher propagation powers, and in late years has been multiplying more rapidly than the others; but as commercial fruit is that required, efforts carefully directed are being made to weed out the less desirable type and replace with a heavy fruiting strain.

Great care is used in handling the seedlings. They are first planted in covered moist chambers on cardboard, which rests on inverted saucers surrounded by water. Here they germinate and start little shoots and leaves. Later they are transplanted to soil, and are placed in the glass greenhouses, from which they are eventually transplanted to the lath house, and finally to the field where they are exposed to the full sunlight. When first removed from the lath house the plants are still in their containers, and on being accustomed to their new surroundings they are removed from the containers and placed in the field.

In the glass houses the young plants have a tempered sunlight and are fully protected from the weather.

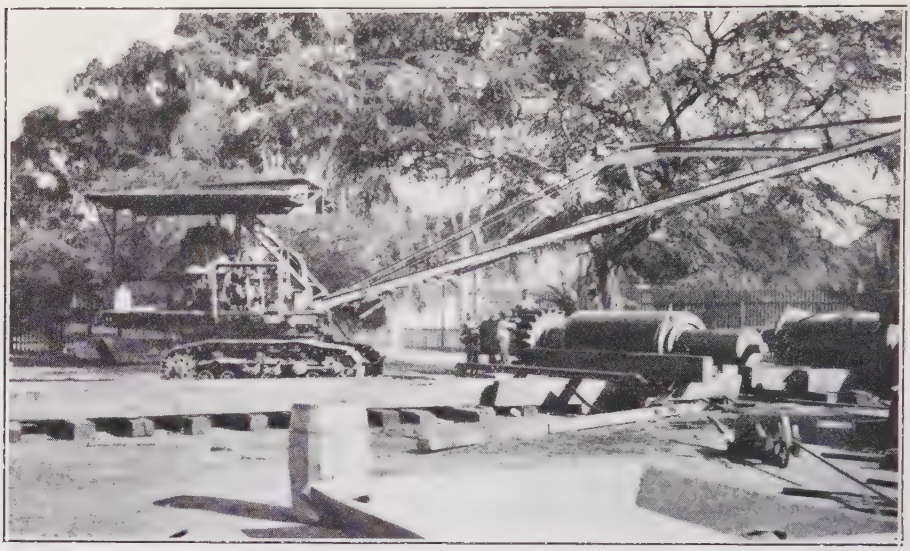


PLATE 28.—PINEAPPLE INDUSTRY, HAWAII.
A portable Field Cane Loader, worked on the block system, Hawaii.

PLATE 29.—PORTION OF ONE OF THE LARGEST PUMPING STATIONS IN THE WORLD, IN THE HILLS OF OAHU.
This station, No. 4, lifts 42,000,000 gallons per diem. The plants of the controlling company pump, in the aggregate, 110,000,000 gallons every 24 hours.

Plate 30.—Pineapple Lands on Oahu, Hawaiian Islands.

Plate 31.—An Hawaiian Pineapple Field.
Showing paper mulch strips laid ready for planting.

The lath house exposes the plants to half sunlight and partially protects them from the weather.

In these buildings every stage, from seedling to mature plant, is specially cared for. In normal field practice the tops or some other hardy part of the plant is used, and it is not necessary to take so many precautions against the sun or weather.

Quarantine.

Strict quarantine exists to protect the Cayenne and other varieties from insects that thrive in other parts of the world. Should the experiment station require to bring a new variety into the Islands, it could do so only in a very round-about way. The plant would need to be kept in quarantine in Washington for a year or more, and then it, or one of its descendants, would be sent to the Islands, there again to be kept in quarantine for another long period, so that it would require a few years to introduce a new variety.

Labour-saving Machinery.

The development of labour-saving machinery is most marked. A combination subsoiler and plough and a paper-laying machine are two important achievements in this direction.

The subsoiler and plough, which is drawn by mules, drops to the subsoil and then ploughs the ground.

The paper-laying machine is made in the form of a sled, which carries the paper roll. The machine is drawn by mules or tractor, and smooths the furrows as it moves along and lays the paper; an attachment behind the paper roll crowns the edges of the paper to keep it down.

Manufacture of the Paper.

Most sugar mills in the Hawaiian Islands have considerable excess of megass (cane fibre) than is required for fuel for crushing and manufacturing. This is used in a variety of ways—fuel in factory during the slack season, fuel for irrigation power stations; while the Olaa Sugar Company's factory on the island of Hawaii convert their surplus megass into paper for use in the planting of sugar-cane and pineapples. This sugar factory, when crushing 60 tons of cane per hour, averages 25 to 30 tons of surplus megass in 24 hours, which all goes through the paper mill. Samples of this paper were collected.

PINEAPPLE CANNING.

I had the opportunity of inspecting the Queensland State Cannery when they installed modern pineapple machinery in the form of Ginaco machines about the end of 1918, and I was naturally interested to see the development since that date. I visited the Baldwin Packing Company's cannery at Lahnia, on the island of Mani, and the Californian Packing Company, Honolulu. Both these canneries are fitted with Ginaco machines. The latter place has nineteen on one floor with an output of approximately 2,500,000 cases of canned pines per year. Many improvements have been made on the machinery as installed at the State Cannery, and these could be easily fitted if royalties on patents can be arranged.

System of Handling.

The pines are taken from cases at landing stages and placed on the Ginaco machine conveyor. The conveyor elevates the pines to the machine, where they are skinned and cored in one operation, and then fall on a travelling rubber belt. Any pines that need trimming on the ends, due to any peculiar shape of the fruit, are touched up on a special cutter running at a speed of 1,800 revolutions per minute (this machine has been responsible for saving at least two hands per machine), and further hand trimming is attended to while travelling along to the slicing machine. After slicing, the fruit travels along a ribbed rubber belt. The ribbing allows of the pine slices being easily lifted for placing in the tins.

Pineapple Crush.

This is the term agreed upon by canners for broken slices and good whole pieces of pineapple. These large pieces of broken pineapple are put through a mincer, canned, and treated separately, and is largely used for salads, pies, &c. Supply is only about 75 per cent. of the demand for this product.

Pineapple Jam.

Jam is made from the pineapple fruit scraped from the skins in a machine called a skin eradicator. In the installation, as arranged, by the California Packing Company, the skins are automatically fed into the Fisher Patent Eradicator with the Opperman Patent attachment. After the fruit is separated from the skin the fruit passes along the conveyor to brass jam pumps, and thence to boiling pots. The skins pass to the conveyor on to grinding mill.

Plate 32.—Paper Mulch in use on Hawaiian Pine Lands.

Plate 33.—Planting Pineapples through paper mulch, Hawaiian Islands.
The paper is manufactured locally from megass.

Treatment of Skins and Manufacture of Syrup.

The skins are then treated in a similar manner to sugar-cane. Methods differ slightly in various factories, but the ultimate objective is the same—the conservation of all juice and the manufacture of syrup.

The skins are passed through shredders, rollers, or, in the case of the Baldwin Packing Company, a worm press similar to a grape-press.

The extracted juice is then pumped to liming tanks and neutralizer. After treatment by liming it is pumped to a heater and elevated storage tanks. Clarification and filtration, similar to sugar-mill practice, is carried out, and finally the pineapple juice, in the form of a golden fluid, is run into storage tanks for supply to pineapple being canned.

One gallon of juice treated as above is equal to 1 lb. of sugar, and it is claimed that the pineapple takes a better colour and flavour than when treated with ordinary sugar syrup.

Evaporation of the Juice.

Some of the canneries evaporate a certain amount of water from the juice, while others claim the evaporated syrup darkens the pineapple, while the original clarified juice gives the true golden colour.

PLATE 34.—AN IRRIGATION CHANNEL, LAID THROUGH PINE LANDS TO IRRIGATE CANEFIELDS FURTHER ON, OAHU, HAWAIIAN ISLANDS.

The water supply is obtained by tunnelling into the mountains to spring sources.

The Future of the Industry.

Big projects are in hand for extending the industry and increasing supplies. Included in the lands of Upper Hoolehua and Palaau, connected with the proposed Waihanau water development project, are some 4,000 acres of the best pineapple land in the territory, and conferences between the Hawaiian Homes Commission and local pineapple people brought out the fact that a settler, assisted by his wife and three or four children, can take care of approximately 30 acres of pineapples after the land has been ploughed and the fruit planted. The only outside assistance they will need, according to the *Honolulu Star—Bulletin*, will be at harvesting time. Provided the settler is successful, he can clear 1,000 dollars an acre in a four-year period, or 30,000 dollars from 30 acres in four years, or 7,500 dollars a year.

If it is decided finally to introduce pineapple cultivation, and if the commission is convinced that one family can care for 30 acres, arrangements will be made whereby this size of tract may be allotted to a single family.

The opening of the lands of Hoolehua and Palaau will constitute the second unit of the Hawaiian rehabilitation project. The first unit is now established on the lands of lower Kalamaula, near the port of Kaunakakai, and is known as Kalanianaole Settlement, being named after the late Prince-Delegate Jonah Kuhio Kalanianaole, who fathered the rehabilitation project.

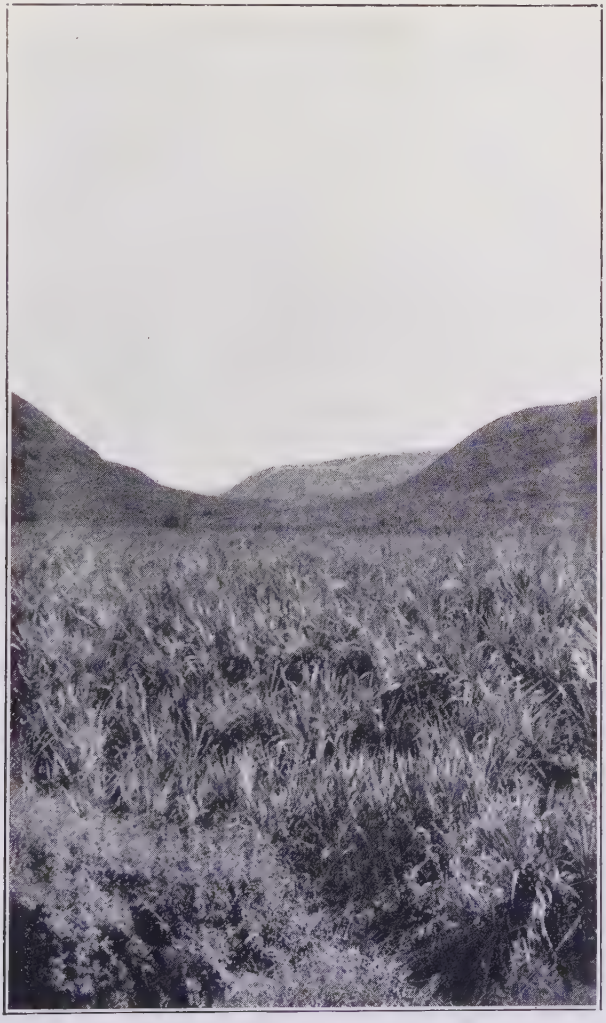


Plate 35.—Plant Cane on Oahu (Hawaiian Islands). Note irrigation pipe line in the distance. The pipes are of steel, 6 ft. in diameter.

IRRIGATION IN QUEENSLAND—VIII.

H. E. A. EKLUND, late Hydraulic Engineer, Queensland Water Supply Department.

The first of this series, a historical note, was published in the July Journal. Irrigation in the Lower Burdekin was reviewed in the August number, and the instalment in the following issue covered Irrigation in the West. In the October Journal practical considerations were discussed, the November number contained notes on Surface Supplies, and the following instalment covered notes on the Duty of Water and the preparation of lands for irrigation. In the last issue systems of irrigation were described. Subjoined is the concluding article of the series. In the next issue the tables referred to from time to time in the text will be published.—Ed.

SPRAY SYSTEMS.

Spray systems, hardly ever considered until comparatively recently, are now much favoured by irrigators. When they first made their appearance it was claimed and thought that here was the solution of all difficulties in connection with grading and subsequent labour of applying water. Control seemed well-nigh perfect, and though some imperfections were known to exist, these were considered as good as overcome. Subsequent experience has shown, however, that spray systems are not the universal panacea they were thought to be, but rather that they have their own special field in irrigation. In this, even, they require to be manipulated with some skill and experience, to give efficient and satisfactory service.

All spray systems attempt, more or less successfully, to apply the water to the soil in imitation of rain, and so at least secure the greatest aeration possible. To achieve the object water is transmitted to the crop to be irrigated in pipes—under pressure. In this all spray systems are alike, but the mechanical appliances used in the attempt to secure an even distribution differ more or less.

A very great number of advantages of spray systems over ordinary methods of irrigation have been claimed, but it will be sufficient to here mention a few that do not appear to have been disputed:—

1. Minimum amount of waste.
2. Some preparatory work obviated.
3. Aeration improves the quality and, therefore, the value of the water used.

It may be contentious ground to state that spray systems have disadvantages as well as advantages. As a matter of fact, at a modest estimate there are three spray systems for every known method of distributing or applying water by gravity. Inventions are still being made and perfected, the reason presumably being that there is room for improvement.

Spray systems are, broadly speaking, of two kinds:—Those which effect the distribution by a series of circles radiating from a central standpipe provided with a special rose, nozzle, or revolving arms; and those which accomplish the desired effect by the parallel motion of a pipe over the ground to be watered. The former kind are termed radial sprays; the latter overhead or parallel.

Theoretically the most apparent disadvantage of at least the radial spray is that, as circles will not fit together, the irrigator must choose whether he prefers to have some of the ground watered twice or not at all. In actual practice the effect is neither as good over the watered area nor as bad over the supposedly unwatered portion as a paper survey would lead one to suppose.

It will, however, be of interest to glance at the diagrams given in the following figures:—

1. By placing the standards in the middle of a square, the corners would get a minimum of water, as shown in Fig. 53. The area thus left unwatered is approximately 21 per cent. of the square.
2. An obviously better arrangement is to place the standards at the corners of equal sided triangles. The theoretical area thus left unwatered is only about 9.3 per cent., and if the rest of the distribution can be shown to be even, seepage and the capillary action of the soil can be trusted to take care of this small amount of irregularity. (Fig. 54.)

Fig. 53

Area of Square 100·00 Sq ft
" " Circle 78 54 " "
Balance unwatered. 21 46 " "
or 21 %

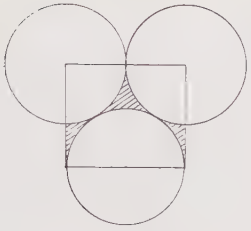


Fig 54

Area of Rectangle 86 60 Sq ft
" " contained Sectors } 78 54 " "
Balance of Area unwatered } 8 06 " "
Say 9·3 %

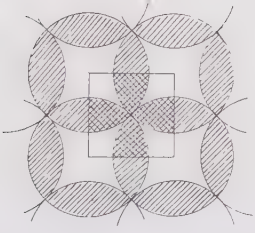


Fig 55

Area of Rectangle 49 99 Sq ft
Area of Portion watered twice } 28 556 " "
Say 57 %

Area of Circle 78 54 " "
Portion of Circle watered twice } 57 11 " "
or 73 %
Portion of Circle watered once } 21 43 " "
Say 27 %

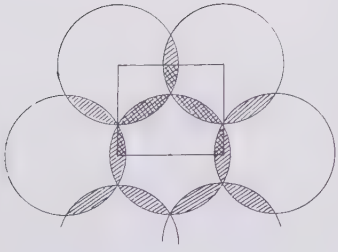


Fig. 56

Area of Rectangle 64 95 " "
Area of portion watered twice } 13 59 " "
Say 20 %

Scale 10 = 1"

3. The next arrangement is similar to the first, but the standards are placed much more closely so that parts of the area commanded overlap. The first arrangement indicates the maximum distance apart for standards. Fig. 55 the minimum. Here the area watered twice is about half the total area, and the best arrangement of this type lies clearly somewhere between these two extremes.

4. The only other possible type of arrangement is the extreme case of No. 2 above, the sides of the equal sided triangles being shortened until no space is left between the circles. The theoretical result is a double dose for about 20 per cent. of the area; but, as in case 3, the best arrangement lies in between the extremes. (Fig. 56.)

In any installation of machinery or appliances, there are at least three things to be carefully considered before making a decision. These are:—

1. First cost.

2. Operating and maintenance cost.

3. Depreciation based on probable life of plant.

The first cost of a plant is often the factor which decides its purchase. But a plant low in first cost may, in the long run, prove more expensive than one the first cost of which appears very high. Take a case in point.

A and B have both 10 acres of cultivation to be irrigated. It is similarly situated and the lift is the same, and the same quantity of water is used by both. But A takes three days to irrigate his 10 acres; B requires only two days for each watering.

	A bought a plant for £800.				B paid £1,100.		
Operating Costs—							
Fuel first year	54	0	0	..	26	10	0
Driver's wages	21	12	0	..	18	0	0
Oil, waste, &c.	3	10	0	..	1	0	0
Labour to irrigate	36	0	0	..	24	0	0
Interest at 5 per cent.	40	0	0	..	55	0	0
Depreciation at 10 per cent. ..	80	0	0	8 per cent—	88	0	0
Maintenance, cost of repairs, and extras	30	0	0	..	12	0	0
	£265	2	0		£224	10	0

This shows a saving in favour of the more costly plant amounting to over £40 per year, partly due to the smaller amount of fuel used and the shorter time in which it can accomplish the work, and also because the depreciation on a well-housed and tended plant can reasonably be taken as less than on one indifferently cared for.

Another essential thing is to be sure that the plant obtained is suitable for the locality and crop to be grown. It is just here that the choice may mean success or failure at the outset.

Regarding operating and maintenance expenses, labour to irrigate, &c., it is well to remember that this does not apply to spray systems only, but is equally true where the distribution is done by gravity. Whether the water is obtained by pumping or gravity, the gravity distribution should always be first considered, and if found impracticable or not economical for some reason or other, then, but not till then, should a spray system be considered.

Each irrigator, in installing a spray system or any other machine, would do well not to take things for granted. It is not fair to either party to condemn an appliance simply because its operation has not been fully grasped. As a rule, the vendor is probably just as anxious as the purchaser that the appliance should be a howling success rather than a squealing failure. Mistakes are sometimes made, but reputable houses generally prefer to know about such, as soon as possible, and certainly before anyone else engaged in the same line.

Failure of sprays to work may sometimes be caused by frogs getting into the pipes, and water weed, fungus growths, &c. A very efficient screen on the suction should always be an essential point.

The pressure at which the sprays have been recommended to work should be strictly observed, and a pressure gauge so placed that the operating pressure can be read at any time.

A slight wind is no disadvantage, as it generally ensures a more even distribution; but note should be taken of the prevailing winds and the sprays placed accordingly. Judgment is also necessary in placing the gauging tins.

"Parallel" and "Overhead" Sprays.

As yet there are not many of these in use in this State. Attempts have been made to introduce the system for growing sugar-cane, and in growing vegetables, &c., but most of these plants are still only in the experimental stage. Some makers in the Southern States appear to have had very fair success, but no definite data are to hand.

Sub-Irrigation.

As the term implies, this system aims at supplying the water needed direct to the root region of the growing crops or trees, from beneath the surface. The economy of water usually experienced in this system lies in the fact that the surface is always kept in a fine state of tilth (the surface is never wetted) and evaporation is consequently a negligible quantity. Another advantage is that, owing to the absence of any caking of the soil, the roots are always able to obtain some nourishment indirectly derived from the easy access of air.

The cost of sub-irrigation renders it one of the most expensive methods of irrigation known, but it is also the most efficient. It is a method largely favoured by fruitgrowers in some parts of America, where both land and water realise high prices. One of the advantages of the system is that water at a uniform temperature can be applied just where it will do most good, and where a good deal of forcing is done to catch early markets the system is particularly useful. In porous soils it is stated to be a failure, and to maintain the drains free from root growth and other obstructions makes the method too costly to be recommended except in very special cases.

Some of the Drawbacks of Irrigation.

The chief trouble accompanying irrigation is in most cases caused by the irrigator himself. It has already been mentioned, perhaps more than once, that too much water is bad, whether intentionally or unintentionally applied. Where the subsoil or substratum is porous, the only manifestation of excessive use of water is a leaching of the soil with a corresponding reduction in the yield. But where the substratum is impervious nature punishes the over-indulgent irrigator very severely.

The first sign of soil souring through over watering is usually manifested in dying vegetation. It may appear unaccountable at first, but a hole dug down to a depth of about 4 feet will soon reveal the cause.

If the trouble is coped with adequately, and in time, serious results may be prevented, but the first thing to look for is the cause. If the cause is seepage from channels, the bad places must be lined, as has been done at Yanco, in New South Wales, and Muldura, in Victoria. The subwater surface must next receive attention and by a proper system of drains be lowered in order to obviate the next trouble, which is the appearance of "alkali" patches.

In Mildura the subwater surface was, on investigation, found to have risen to a dangerous extent, and some patches of alkali also appeared. Attempts to drain the area by sinking wells have proved successful, as a porous stratum was found about 60 feet below the surface. Wells are now sunk not for water, but to get rid of it; drain pipes and drains discharging the surplus into these wells, where it disappears in the porous strata.

At Bingera, near Bundaberg, the wise precaution was taken to first tile drain the whole of the area, the original intention being to prevent waterlogging. It has already been mentioned how this precaution was found particularly useful in another way.

Where the trouble occurs and is not checked in time, the irrigator is faced with the more serious problem of overcoming the effect of the "alkali." Irrigators usually distinguish between "black" alkali and "white" alkali. The former, or black alkali, consists chiefly of sodium carbonate, which, when present in excess in soil, dissolves the humus and shows black rings on the white patches where surface waters containing the salt have evaporated. Vegetation grown in soils suffering from excess of the carbonate turns black before it wilts and dies, and the name "black" is probably derived from either or both of the above manifestations.

Black alkali is usually considered the worst to cope with, but Professor E. W. Hilyard has shown by actual experiment that the proper antidote for black alkali is a good dressing of gypsum. (This alone will clearly be of no use unless the cause of the trouble is removed by proper drainage, as indicated above.) The gypsum is most beneficial when applied at the rate of about 500 lb. per acre per annum, and with the dressing of gypsum must follow irrigation with drainage to assist the action of the corrective.

To the more inquisitive it may be interesting to know why gypsum (a sulphate of calcium) should have the property of counteracting the evil effects of sodium carbonate (washing soda). The reason is that the calcium in the gypsum in the presence of water combines with the carbonate of the sodium carbonate and the sodium carbonate becomes a sulphate, in which form it is less harmful. Calcium carbonate or carbonate of lime is not a harmful constituent of soil, and the exchange thus effected renders the soil quite fit for crops in about three to four months after the first application.

Chemically the action is thus represented:

$$Ca\,SO_4 + Na_2\,CO_3 + Aq = Ca\,CO_3 + Na_2\,SO_4 + Aq$$

The reason for the exchange being that calcium carbonate is more insoluble than any of the other combinations.

"White" alkali usually denotes the sulphates and chlorides of sodium and magnesium. Sometimes manganese sulphate and a trace of potassium may be found. (It will be interesting to recollect in this connection Mr. Symmonds' experiments wherein he, by the addition of nitric acid to the soil, converts these harmful ingredients to nitrates, so converting them into valuable fertilisers.)

The cause of the appearance of alkali is due to a concentration by evaporation of the small amounts of these salts, usually found in solution in all waters. Repeated applications without drainage leave the salts in the soil, and finally the soil is so saturated with them that it becomes unproductive.

The more salts carried in solution the sooner will the danger mark be reached. The careful irrigator will keep a close watch on his supply, because sometimes when a river is low, especially near the coast, salt or heavily mineralised waters find their way into higher reaches of the river, which, under ordinary conditions, contain water suitable for irrigation. One application of such water may ruin not only the crop, but spoil the land for some time to come.

The best preventive against heavy evaporation is usually considered to be "mulching." The best mulch is a well tilled surface upon which a crust is never allowed to form. Hence the motto "Cultivate, Irrigate, Cultivate."

IMPORTATION OF COTTON SEED AND RAW COTTON—STRINGENT CONDITIONS.

The Hon. W. N. Gillies (Acting Premier and Minister for Agriculture), referring recently to a message from Melbourne to the effect that the importation of cotton seed or cotton lint into Australia, except under certain stringent conditions, had been prohibited under proclamation, stated that this was the outcome of action taken by himself, and which commenced as far back as 1920. Recognising the danger of the possible introduction of pink boll weevil and other cotton pests into Australia through the unrestricted importation of both cotton seed and cotton lint, he made representations to the Federal authorities for the strict application of the Quarantine Act to both these products, and it may be mentioned that a specific instance quoted was the detection of the importation into Rockhampton of an American clock packed in seed cotton.

Following on the earlier representations, the administration of the Federal Quarantine Act Regulations was tightened up, and finally a proclamation was issued that all cotton seed imported into Australia should be landed at Melbourne. Mr. Gillies immediately wired the Director-General of Health strongly objecting to any port other than Brisbane for the entry of cotton seed. He pointed out that this was a most vital matter affecting the future success of the cotton industry in Queensland, where 90 per cent. of the total output of Australia is grown. To this proposal the Commonwealth agreed, and it is understood that the proclamation referred to provides for the prohibition of the importation of cotton seed and raw cotton into Australia subject to the following conditions:—

1. That the permission of the Minister to import the seed shall first be obtained.
2. That cotton seed shall be landed only at the port of Brisbane.
3. That cotton seed on arrival shall be disinfected by heat or by such other method as may be ordered by the Chief Quarantine Officer, and shall after being planted remain in quarantine with its product until released by the Chief Quarantine Officer, during which period it shall be subject to supervision by Quarantine Officers or by officers authorised for the purpose by the Director-General of Health.
4. That imported raw cotton shall be landed only at the port of Sydney, and shall, before being released from quarantine, undergo disinfection either by heat or by hydrocyanic acid gas, or by such other method as may be ordered by the Chief Quarantine Officer.

MOLASSES AS STOCK FOOD.

By J. C. BRUNNICH.

Some rather extraordinary ideas exist in the minds of the public with regard to the feeding value of molasses, and statements which appear from time to time, that a pound of molasses has the same food value as a pound of corn, are absolutely misleading.

Molasses is a purely carbonaceous food, therefore only a heat or energy producing nutrient, and has absolutely no value as a flesh-forming nutrient, as molasses contains no proteins.

Our Queensland molasses contain on an average—

24 to 26 per cent of water.
50 to 58 per cent. of sugars.
7 to 10 per cent. of ash or mineral matter.
18 to 20 per cent. other organic matter, including amides.

The ash itself contains—

38 to 44 per cent. of potash.
8 to 24 per cent. of lime.
1 to 2 per cent. of phosphoric acid.

An average daily ration for a cow, weighing about 8 cwt., must contain an amount of carbonaceous nutrient equal to about 11 lb. of starch, and this amount would be supplied by feeding—

Corn (maize)	13 lb.
Cotton Seed Meal	14 lb.
Pollard	15 lb.
Wheat	16 lb.
Good Bushhay	19 lb.
Molasses	19 lb.

The chief value of molasses as a stock food lies in the fact, that the addition of molasses to dry coarse fodders makes them more palatable and stimulates the appetite. The large amount of soluble salts of potash and lime, and amides, however, acts adversely on the digestion, and may cause scours unless fed in moderate quantities.

The amounts of molasses which can be safely given to animals, as an addition to their daily rations, are as follows:—

	Per 1,000 lb. live weight.
Horses	3-4 lb.
Cows	2½-3 lb.
Oxen	3-4 lb.
Sheep	4 lb.
Pigs	5 lb.

Larger amounts, up to twice the quantities above stated, have been fed successfully.

In Louisiana, mules are given up to 9½ lb. of molasses per head, mixed with corn (grain, cobs, and husks all ground together) and hay. For horses about 1 quart, diluted with water, is mixed with the grain and hay feed.

Molasses is particularly useful when fed in combination with concentrated nitrogenous foods like cotton seed meal, coconut oil cake, linseed meal, &c.

Molasses meals and feeds, made by saturating with molasses and subsequently drying, cotton seed meal, oil cakes, mill offal, peat moss, &c., are put on the market and have good food value. It is imperative that such feeds are made as dry as possible, as they are liable to ferment and become mouldy if they contain too much moisture.

The best and cheapest method to feed molasses is to dilute it with two to three parts of hot water and to mix it with the dry fodder immediately before feeding.

On large farms in America the molasses is mixed and heated in tanks and in special mixing machines thoroughly incorporated with the cut straw or hay.

Molasses should not be given to young calves, and only with caution in moderate amounts to cows shortly before calving.

Molasses containing more than 28 per cent. of water should not be sold as stock food.

ABSTRACTS AND REVIEWS.

All foreign agricultural intelligence in this Section, unless otherwise stated, has been taken from "The International Review of the Science and Practice of Agriculture," published at Rome by the International Institute of Agriculture.

Studies on Poultry Feeding.

I. Schofield, M.A.: Feeding Milk to Poultry. "The National Poultry Journal," Vol. LXII., Part 3, No. 116, p. 151. London, 1922.

II. Wood, D.: Feeding the Heavy Layer; How to Supply the Essentials to Heavy production. *Ibidem*, No. 117, pp. 164-165.

III. Bossert, A.: The Rational Feeding of Poultry. *Ibidem*, No. 126, pp. 295-297; No. 127, p. 305; No. 128, p. 319.

IV. Dobbin, R. C. H.: Some Lancashire Experiments—Wet *versus* Dry Mash. *Ibidem*, No. 131, p. 363.

V. Hepburn, J. S., Holder, R. C., and others: Rations for Feeding Poultry in the Packing House. United States Department of Agriculture, Bulletin No. 1052, 24 p. Washington, 1922.

I. *Feeding Milk to Poultry.*—The by-products of milk (skim milk, whey butter, or condensed milk or whey, whether liquid or in powder) have proved most useful in the feeding both of chicks and of adult fowls. Powdered milk must be dissolved before use in ten times its weight of water. Its nutritive value, if equal weights are taken, is the same as that of meat-meal.

Skim milk can be fed either fresh or sour. It is a mistake to attribute the efficacy of skim milk or whey solely to the lactic acid they contain and to believe that lactic acid can be substituted for the above substances, although a small dose of lactic acid is very good for chicks, as it not only acts as a mild disinfectant of the digestive canal but is also a stimulant and an excellent remedy against coccidiosis and other diseases. If, however, an excessive amount of lactic acid is given, it does serious injury by destroying the mucous membranes; further, it is of no use in the feeding of adult fowls when a well-balanced ration is given; hence it is best to reserve lactic acid for a medicine and to use for food purposes only the by-products of milk.

Skim milk, whey, and a solution of powdered milk are put into the drinking-troughs. The acid solution is made into a mash. Milk powder can also be added to the mash in the proportion of 5 to 10 per cent. About 5 litres of mash per day is enough for 100 fowls. The whey, or solution of powdered milk, should be fed at the rate of at least 5 litres a head for 100 head. By-products of sweet and of acid milk ought not to be given at the same time, but may be fed on alternate days.

From the results of his experiments Schofield concludes that non-acid milk by-products suit young fowls better than acid ones, which ought to be used as a condiment rather than as a food.

II. *Feeding the Heavy Layer.*—Wood has studied the application to the feeding of heavy lawers of our modern knowledge respecting the effect of the mineral constituents and the vitamines in the different feeds. As a result of his own experience he suggests the following ration:—Equal parts of wheat and oats; mash middlings—bran, gluten, fish meal, chopped clover or lucerne hay, dried yeast, soy-bean meal, and ground oats (4 : 4 : 4 : 2 : 2 : 1 : 1). Once in three weeks 2 per cent. of salt should be added to the mash, and once a fortnight 1 per cent. by weight of crude cod liver oil may be introduced.

III. *The Scientific Feeding of Poultry.*—A hen that is not laying should be fed, in order for the ration to be well balanced, for every 100 parts protein 452 parts of carbohydrates and 20 parts of fat. A hen laying 1, 2, 3, 4, 5, 6, or 7 eggs weekly ought to consume respectively, for every 100 parts of protein, 421, 394, 375, 362, 347, 336, or 327 parts of carbohydrates, and 26, 30, 33, 36, 39, 41, or 43 parts of fat. In calculating the ration of a laying fowl, Bossert advises that the egg-production should be estimated at 5 or 6 eggs per week—viz., the ration should be 100 protein, 340 carbohydrates, 40 fats; or, in the simplest terms, 10 : 34 : 4.

The following rations fulfil all these conditions per ten head and per day:—

(1.) Middlings 280 gm., meatmeal 80 gm., wheat 370 gm., maize 110 gm., hemp seed 110 gm., bonemeal 14 gm., green food (grass and roots) 800 gm.

(2.) Middlings 200 gm., fishmeal 100 gm., wheat 400 gm., maize 100 gm., hemp seed 140 gm., bonemeal 14 gm., green food 800 gm.

The grain is given separately but at the same time as the other substances (which are mixed into a mash) both morning and evening; the green food is given midday.

IV. *Dry versus Wet Mash.*—This paper gives an account of various experiments described and discussed at a meeting of the Lancashire Utility Poultry Society. Most of the experiments had been carried out on the county farm, at Hutton, and show that wet mashes should not be discontinued but given alternately and supplemented by grain fed separately, and by green food.

V. *Fattening Rations for Poultry.*—When, as is the case in the United States, poultry are sent long distances, they should not be fattened by the rearer, as the birds lose their finish on the journey, and the sender cannot despatch them as frozen meat. Therefore the poultry-rearing industry has to be divided into two branches—the production and fattening branches respectively. Fattening takes one to two weeks and is carried out at the packing-houses.

Poultry-fattening as a specialised industry is making rapid progress in the United States; this induced the author to carry out his investigations in the Food Research Laboratory of the Department of Agriculture of the United States. He compared different rations and determined:—

(1.) The increase in live weight obtained.

(2.) The improvement in the edible portions of the fowl.

Two kinds of experiment were carried out; in the first, various tests were made for each ration with twelve fowls fed and studied separately.

In the second class, the so-called battery experiments, a larger number of fowls (up to over one thousand in a lot) were studied in flocks. The rations fed the control lot consisted of maize-flour and butter-milk (40 : 60). In the experiment rations, part of the maize-flour and of the butter-milk was replaced by one or more of the following foods:—Barley, maize-flour, whole oats, entire oatmeal, oatmeal patents, ground oats, rice bran, rice husks, ground rice, wheat offals, wheat middlings, coconut cake, ground decorticated ground-nut cake, undecorticated ground nut cake, colza cake, soy-bean cake, kafir, ground milo, lucerne, meat scraps, condensed whey, or powdered whey. The fowls were weighed on the 1st, 4th, 8th, 11th, and 14th days of the experiment.

One table gives the composition of the foods used; the other twelve give the results of the experiments.

The averages of the most important results are to be found in the following table:—

Classes of Birds.	No. of Birds per Class.	Increase in 4 Days.		Increase in 8 Days.		Increase in 11 Days.		Increase in 14 Days.
Cockerels	612	12	30	23	57	31	78	40
Pullets	396	..	..	17	60	24	85	29
Adult Cocks ..	336	11	50	17	77	21	93	22
Hens	456	4	34	8	65	10	84	12

The younger birds (cockerels and pullets) increased most rapidly in live weight when given a concentrated protein food, such as cake or meat scraps. The hens did not give uniform results, from which it would appear that meal suits them as well as a concentrated protein food.

The best length for the fattening period depends to a great extent upon circumstances. A fortnight is certainly not too long for cockerels, since they continue increasing in weight rapidly for this time; whereas pullets gain all their weight in eleven days. In the case of adult cocks and hens, the fattening period must be limited to six to eight days.

The analyses made of the different parts of the body of a large number of birds belonging to the various classes showed no difference produced by the rations on the composition of the edible portions, or the dressing losses, although the classes differ perceptibly in both these respects.

The yield of edible portions (in percentage of live weight) was for unfattened and fattened birds respectively:—Cockerels, 56 and 60; pullets, 63 and 67; cocks, 62 and 64; hens, 70 and 71; which shows the advantage of fattening. In the last chapter is given the composition of rations for fowls that are to be fattened.

The Food Value of Sugar.

"The World's Work."

The people of the United States spend about 100 millions sterling on soft drinks every year. Most of those contain a good proportion of sugar, the dietetic value of which must not be overlooked. Sugar is superior to alcohol as a self-starter. Experiments in the Nutrition Laboratory of the Carnegie Institution of Washington show that sugar is absorbed and consumed in the body as soon as alcohol or even sooner. Within four to ten minutes after sugar is taken on an empty stomach the effect is shown in the rise of the respiratory quotient. Milk sugar and fruit sugar begin to burn up in the body quite as soon. Glucose and maltose require twenty minutes or more before they become important in metabolism.

In experiments at another station it was found that five ounces of sugar a day added to the ordinary diet increased the available energy of the ration by 25 per cent. There was increased economy in the utilisation of protein by 25 per cent. with the added sugar—although sugar contains no protein.

A study of dietaries in 500 representative families shows that sugar in the various forms of food provide 10 per cent. of the total energy.

Sugar beet stands at the head of all the crops of the temperate zone in the amount of food energy that can be produced in a given area. They are the most efficient of all our machines for the fixation of solar energy in a form so that it can be used in the human body to produce muscular power.

Sugar is a quick-action energy-producing food. It therefore comes more and more into demand as daily life speeds up. Its consumption might be used as a measure of the individual activity of a country. The United States stands at the head of the list in the amount of sugar used, 5,010,757 tons in 1922. This is an increase of 17½ per cent. over the consumption in 1921.

From this it appears that they are consuming 102 lb. each on the average during the year. In dietary experiments it has been found that as much as three-quarters of a pound of sugar a day can be included in the ration of a hard-working man without injurious consequences. This is nearly three times the average national consumption.

Before the war the per capita consumption of sugar by the leading nations of Europe was:—United Kingdom 87·9 lb., Germany 39·7, France 39·1, Russia 15·8, Italy 10·1. Since the war Italy has raised her ration of sugar to 15·4, an indication of an access of energy which is apparent in various other ways. Great Britain, on the contrary, has reduced her ration to 71 lb., of which 19 lb. goes into the manufacture of jams, candy, and beer, much of which is exported.—"The World's Work."

Why do Cream Tests Vary?

H. B. ELLENBERGER—Cream and Milk Plant Mo., 12 (1923), No. 7.

In experiments at the Vermont Experiment Station it was found that the following factors tend to influence the fat content of separated cream:—Low temperature of the milk, high speed of the separator, rich milk, use of a small quantity of milk in flushing the bowl, or reduced rate of flow of the milk into the separator. An unclean or unbalanced bowl may cause considerable variation in the cream test and may reuslt in greater losses of fat in the skim milk.

Methods of Preserving Eggs.

D. B. SWINGLE and G. E. POOL—Montana Sta. Circ., 111 (1923).

The results of a series of tests of different preservatives for eggs are briefly reported. Waterglass in strength of 1·25 was found to be the most satisfactory for home use. Various forms of grease and patented preservatives maintained the quality of the eggs for four or five months, but they were more expensive and not as certain or lasting as the waterglass.

Experiments in the Storage of Fruits.

D. B. ADAM—Jour. Dept. Ag., Victoria, 21 (1923), No. 3.

Studies conducted in the Government Cool Stores, Melbourne, indicated that 32 deg. F. was a more satisfactory temperature for storing pears than were either 34 or 37 deg. Fruits at the two higher temperatures blackened shortly after removal from storage, preventing sale, and wrapping with paper had no apparent effect in preventing this blackening.

The stage of maturity at time of harvest proved to be an important factor. Kieffer pears harvested when slightly green kept much more satisfactorily than did more mature fruits. It is suggested that the blackening of pears in storage is the result of chemical changes which convert arbutin of the skin into hydroquinine and glucose and then into quinone and water. Of the several pear varieties tested, the Kieffer was by far the most susceptible to blackening.

The amount of pathological decay present on stored pears was found to be dependent upon the variety, cultural conditions under which grown, stage of maturity at harvest, and the care in handling. In comparing the effect of wrapping every layer, alternate layers, and no wrapping on Winter Nelis pears, it was evident that all fruits should be wrapped. In a test of the effect of three systems of air circulation on the percentage of mouldy fruit, no one system was found superior. Winter Nelis pears from an irrigated orchard kept as well as fruit from a non-irrigated orchard. Brief notes are given upon the keeping qualities of several varieties.

A GREAT OPPORTUNITY FOR QUEENSLAND.

It has already been announced that the Empire Press Association has arranged to hold its annual conference in Australia early in 1925. This will mean the visit to our shores of a large body of influential British pressmen, as well as delegates from all parts of the British Dominions. Undoubtedly every opportunity will be taken in the Southern States to make our visitors as fully conversant with this great Commonwealth and its people and industries as time will permit. If the usual routes of travel are adopted, this will probably mean that a portion of the delegation may find their way to Brisbane, *viâ* the Darling Downs, with possibly a side trip as far as Bundaberg, a programme with which we are all familiar, and whose utter futility as a means of enabling visitors to gauge the vast resources of this State, most Queenslanders would be prepared fully to admit.

It has been suggested that whilst the visiting pressmen will no doubt take varying routes from England to this continent, every effort should be made to induce as many as possible to travel by way of Singapore, affording an opportunity to make direct acquaintance with the naval base question. Thence a short run to Batavia and by rail to Sourabaya would present many objects of interest, including acquaintance with the sugar industry of Java. The voyage could be resumed by one of the regular steamers plying between that port and Cairns, *viâ* Torres Strait and Thursday Island. Apart from the many features both of island scenery and Dutch and native life and industry which such a route would offer, as compared with the monotonous run across the Indian Ocean from Colombo, the suggested variation would permit of a comprehensive, if rapid, view of North-eastern Australia. Landing at Cairns, a very few days would permit of a visit to the Atherton Tableland, and one or two of our largest sugar-mills. Thence the party could travel by rail to Townsville, as the North Coast Line is to be completed before the date fixed for their arrival in 1925. From this point their journey might be pursued *viâ* Winton and Longreach to Rockhampton, thus enabling the visitors to gain glimpses of our vast interior and its great pastoral industry. If time should permit a delay of a couple of days it would show the extensive sugar-fields of the Burnett and Isis areas, with the thriving cities of Maryborough, Bundaberg, and Childers; and if arrangements could be made for the run through from Gympie to Brisbane by daylight, a further opportunity would be afforded of estimating something of the wonderful richness of this vast territory.

This, to anyone knowing even a little of the geography of our State will appeal as an ideal method of advertising Queensland; and with the display at Wembley Park fresh in their minds, our visitors would quickly pick up the threads of information. It would mean their ultimate return to their homes with a far different impression of the Commonwealth as a whole than if they landed first at Fremantle in the ordinary way. At the same time, it would be quite open for them to take the western route on the journey back to England, and by that means they would practically have circumnavigated the continent, gaining an idea of its potentialities, which no amount of time spent in the capital cities could give them. These are the rough outlines of a scheme originating in the mind of a public-spirited citizen of Cairns; but if it is to be given effect, immediate steps should be taken to organise a persistent and clear-headed advocacy of the plan, both in Australia and in the Old Country, so that the proposals may not be forestalled on the one hand, and so that, on the other, our intending visitors may have time to fully weigh the advantages of the suggested route.

BUNCHY TOP CONTROL.

Affected Areas Proclaimed.

Strict precautions have been taken by the Government to guard against the spread northward in Queensland of bunchy top in bananas. The Acting Premier and Minister for Agriculture (Hon. W. N. Gillies) announced recently that, in order to prevent, if possible, the further spread of bunchy top from the areas in Queensland in which this affection was now present to any other part of the State, a proclamation had been issued for the purpose of dividing the South Coast fruit district into two divisions.

The first division is that adjacent to the New South Wales border on the south, and bounded on the north and west by the Logan and Albert Rivers. Outside of this area, no bunchy top has so far made its appearance; neither is there any bunchy top known to exist within some miles of its northern or western boundary. The proclamation prohibits the transfer of any banana plants out of this division to any other part of the State, consequently the department hopes by this means to prevent the spread of the affection by means of plants.

Further, the area of land lying immediately to the south and east of the Logan and Albert Rivers, in which no bunchy top is now known to exist, will be kept under strict surveillance, and, should bunchy top make its appearance in any banana plant or plants in this area, the plant or plants will be forthwith destroyed.

Areas Affected.

So far, bunchy top in Queensland is practically confined to the plantations that are either in direct touch with those of New South Wales, or to plantations which are either contiguous to these plantations, or are at no great distance from them. Bunchy top has only been found in a few instances outside of what might be termed the main infected area, and is not spreading rapidly. In fact, it is satisfactory to know that in the case of one of these outbreaks, the affection is no more noticeable now than it was when first discovered some twelve months since. Every possible precaution will be taken by the department to prevent the northern spread of bunchy top, and, as already stated, any further outbreaks that may occur in the clean area of No. 1 division will be systematically and promptly dealt with.

Plan of Campaign.

The effect of dividing the South Coast fruit district into two areas will, therefore, be that a strenuous endeavour will be made to prevent the extension of the affection from the existing plantations, and to confine it entirely within its present limits. The clean area between the presently known infested district and the Albert and Logan Rivers will act as a buffer area, and, further, the whole of No. 2 division, that is, the whole of the South Coast fruit district other than that contained in No. 1 division, which extends as far north as the Brisbane River and the railway line running from Indooroopilly to the Toowoomba Range, will also act as a second buffer area, thus providing a double line of defence against the spread of the affection to any other part of the State.

Officers of the Department of Agriculture have been, and still are, making a careful inspection of the area immediately to the south and east of the Logan and Albert Rivers, and this inspection will be systematically continued.

Bunchy Top—Investigations Continued.

In August of last year the Acting Premier and Minister for Agriculture and Stock (Hon. W. N. Gillies) announced that the Queensland Government would give £1,500, being an amount equal to that which the Commonwealth Government then proposed to allot, for investigations into the bunchy top disease in bananas, provided that the New South Wales Government would contribute a like amount.

Mr. Gillies announced recently that since that time negotiations had been carried on between the two States and the Commonwealth Institute of Science and Industry. The arrangement between New South Wales and Queensland, whereby a joint report by Dr. Darnell Smith, the Entomologist of the Department of Agriculture in New South Wales, and Mr. H. Tryon, the Chief Entomologist of the Queensland Department, relating to the investigations to 31st December last, is to be issued, will be continued until the publication of the report. A joint report now, however, is out of the question, as Mr. Tryon is still undergoing hospital treatment for the injuries he received recently, but the Under Secretary of the Department of Agriculture in New South Wales has promised that the issue of a report by Dr. Darnell Smith may be shortly expected.

An agreement was also made that each of the Governments should appoint a scientist to a small committee for the purpose of inquiring fully into the investigations in the past, to advise as to the existing position, and to make recommendations as to further investigations, the report of this committee to be made not later than 1st March next. Executive approval has now been given to the extended scheme. The representative of Queensland upon the Committee of Investigation is Professor E. J. Goddard, B.A., D.Sc., of the Queensland University; the representative of the Commonwealth will be Professor Richardson, M.A., B.Sc., Dean of the Faculty of Agriculture in the Melbourne University; and of New South Wales, Professor R. D. Watt, M.A., B.Sc., Chair of Agriculture in the Sydney University. The preparations for a campaign against bunchy top have thus been made, and as soon as the report of Dr. Darnell Smith was available the committee will be called together by the New South Wales Government to commence its investigations.

"Bunchy Top"—A Buffer Area Proclaimed.

A Proclamation has been issued rescinding the Proclamation dated the 9th September, 1921 (which prohibited the removal of any plant of the genus Musa (Banana) excepting only the fruit thereof from or out of any nursery, orchard, or other place in Queensland beyond the boundaries of an area defined as "The South Coast Fruit District"), and proclaiming that the removal of any plant of the genus Musa (Banana), excepting only the fruit thereof, from or out of any nursery, orchard, or other place in the areas more particularly described as under, to any place in Queensland beyond the boundaries of either of the said areas, is prohibited from the 22nd December, 1923:—

> Commencing on the sea-coast at Point Danger, and bounded thence by Macpherson Range westerly to the source of the Albert River, by that river and the Logan River downwards to the mouth of the latter, by a line passing to the south of Russell Island easterly to Stradbroke Island; and thence by the western shore of that island, a line, and the sea-coast southerly to the point of commencement.
>
> Commencing at the mouth of the Logan River, and bounded thence by that river and the Albert River upwards to Macpherson Range westerly to the Great Dividing Range, by that range north-westerly to the Southern and Western Railway at Harlaxton, by that railway easterly to the Brisbane River, by the right bank of the Brisbane River downwards to its mouth; and thence by the western shore of Moreton Bay south-easterly to the point of commencement;—inclusive of the islands in Moreton Bay north of a line running from the mouth of the Logan River and passing to the south of Russell Island.

The Cheapest Land Labour.

Thus "The World's Work," in discussing the sugar industry:—"The most intelligent and highest-paid labour using scientific methods and power will run out the cheapest land labour."

A MILK-TAINTING WEED *(Monococcus echinophorus).*

The attention of dairymen is called to a weed or shrub which is at the present time a frequent cause of a very serious defect in cream. This plant is not usually eaten by cows, but sometimes in time of drought one or more cows of a herd will take a liking for it, with the result that, if their milk is mixed with that of others, the whole becomes tainted. The taint is abominable and is so penetrating that the cream from the milk of a single cow, fed on the plant, will taint a whole vat of cream and the butter made therefrom; and as cream so tainted is liable to be condemned as unfit for human consumption it behoves dairymen to be on the lookout for cows addicted to the habit of eating it and to exclude their milk from use for dairy purposes.

The late Mr. F. Manson Bailey, Government Botanist, some years ago classified the plant as belonging to *Monococcus echinophorus* of the Natural Order of Phytolacea; but I know of no common name for it. It may, however, be recognised by the following description:—It usually grows on scrub land, in sheltered spots, such as the edges or pockets of a scrub. It grows to the height of 1½ to 2½ feet, and bears bunches of small red berries of a diameter of about one-tenth of an inch. When crushed the leaves give off a very unpleasant smell. Cows that eat the plant are easily distinguished from others by the fact that their milk tastes and smells of the plant, and their excreta gives forth a very unpleasant odour.—FREDERIC J. WATSON, Instructor in Dairying.

General Notes.

Cotton Act Regulations.

Regulations have been issued under "*The Cotton Industry Act of* 1923," which provide that until the 31st July, 1924, the following prices are guaranteed to growers for seed cotton acquired for the Crown under the said Act and delivered at the railway station or port nearest to the land whereon such seed cotton was grown:—

Cotton of less than 1¼-inch staple	5d. per lb.
Cotton of 1¼-inch staple and over	5½d. per lb.

the words "seed cotton" meaning seed cotton that is free from excessive dirt, leaf, stain, extraneous (added) moisture and immature fibre, and is not damaged by weather, &c. The decision of a Government grader shall be final as to whether any cotton comes up to the standard. Weights as determined at an authorised factory shall be accepted unless satisfactory evidence to the contrary is produced. An officer of the Department of Agriculture and Stock shall supervise the weighing of all consignments of seed cotton at an authorised factory. All seed cotton delivered at a railway station or wharf must be properly bagged or baled, marked, and consigned freight on to the nearest authorised factory. Different qualities of seed cotton must not be packed in the same bag, bale, or other container. Orders from growers for the payment to any person of the proceeds of any consignment of cotton shall not be accepted, and all seed cotton acquired under this Act not brought in direct to the gin shall be delivered to and accepted by the Minister for Agriculture on railway trucks at authorised factories, as the Minister may decide.

An Order in Council has also been issued by which all seed cotton now within the State of Queensland and grown within the State before the thirty-first day of July, 1924, shall be and is acquired for the Crown.

A Proclamation has been issued, proclaiming that the period for or during which the Crown guarantees a price for seed cotton shall be from the 17th January, 1924, to the 31st day of July, 1924.

Matured Fruit Defined.

As some pineapple-growers appear to be uncertain as to the exact meaning of "matured fruit," as applied to pineapples in the regulations under the Fruit Cases Acts, issued on the 16th November last, the Acting Premier and Minister for Agriculture and Stock (Hon. W. N. Gillies) has referred the matter to the Director of Fruit Culture and the Agricultural Chemist, from whom he has received the following report:—

> It is very difficult, if not impossible, to determine accurately the degree of ripeness from an external examination of the fruit, as the term "matured fruit," when applied to pineapples, is dependent on the percentage of sugar present in the fruit, which must not be less than 10 per cent. during the months of October to March inclusive, or 8 per cent. during the months of April to September inclusive. The percentage of sugar can only be determined accurately by making an analysis of the juice, but for all practical purposes if the juice is expressed, placed in a beaker or similar vessel, and tested with a Brix saccharometer, and if found to register 12 degrees during the summer months and 10 degrees during the winter months, this should give the 10 and 8 per cent. respectively of sugar required by the regulation. At the same time, the following indications of ripeness will be of assistance to growers:—
>
> *Summer Months.*—The pips should be full and the dark vivid colour should show a sign of becoming lighter or paler, even though there is no appearance of yellowing at the base of the fruit. The fruit when cut should be juicy, and the flesh showing a slight yellowish tinge, but if the flesh is white and woody, the juice scanty and of a slimy nature or insipid flavour, the fruit is immature. There should be a fair quantity of juice which should possess a distinct sugary taste.
>
> *Winter Months.*—The pips should be full, and the base of the pine should show colour. If picked at an earlier stage, especially in the case of smoothleaf pines, the fruit will never develop its sugar contents.
>
> A local firm can manufacture suitable small Brix spindles for the testing of pineapple juice at a reasonable cost.

L.P.A. Elections—A Regulation Revoked.

Regulation 11 under "*The Primary Producers' Organisation Act of* 1922" has been revoked, and in lieu thereof a Regulation has been issued stating that the rolls of all Local Producers' Associations shall be closed for the purpose of the election on a date to be fixed by the Council, and notified to the secretary of every Local Producers' Association by the Council. Such date shall be at least fourteen days before the last date fixed for the receipt of nominations. The secretary of each Local Producers' Association shall furnish to the returning officer, as set out in Form No. 4 in the Schedule hereto, or to the like effect, a complete roll showing names and addresses of persons who were members of the association on the day fixed for closing the rolls, and such roll must reach the returning officer not later than the last date for the receipt of nominations. Such roll shall be certified by the chairman and secretary, and shall be used by the returning officer as the official roll of members entitled to vote at the election: Provided that if the certified roll does not reach the returning officer in time to be used at the election, the returns of members filed by the Council in pursuance of Regulation 7 of these Regulations may be used as the roll for the election.

Fruit and Vegetable Quarantine.

The Acting Premier and Minister for Agriculture and Stock (Hon. W. N. Gillies) has received from the Acting Prime Minister (Dr. Earle Page) the following modification of the Quarantine Regulation issued recently by the Department of Agriculture, United States of America, relative to the importation of fruit and vegetables into that country from Victoria, South Australia, and Tasmania. The same authority also issued a warning, dated 30th October, 1923, against the importation of overripe or damaged lemons:—

> The quarantine restricting the entry of all fruits and vegetables into the United States, which becomes effective 1st November, 1923, has been amended to make provision for the entry of certain hothouse-grown fruits and of other specialties which can be accepted by the United States Department of Agriculture as free from risk of carrying injurious insects, including fruit flies. The original wording of the quarantine made possible the entry of any vegetables which could be so determined, but the entry of fruits was limited to a definite list with certain exceptions as to a comparatively small number of countries and districts.
>
> From information which has come to the Department subsequent to the public hearing preliminary to the issuance of this quarantine, it develops that certain fruit specialties, from the nature of their production or of their utilisation in this country or any of its possessions, may properly be considered as presenting no risk. This amendment provides for the entry of such specialties as properly come under the general purposes of the quarantine.
>
> The entry of no fruit will be authorised under this amendment until it has been submitted to and approved by the experts of the Department. Entry under this amendment has been approved for the following fruit specialties:—
>
> 1. Hothouse-grown grapes, when they can from place of origin and manner of growth be considered as absolutely free from risk.
>
> 2. Sour oranges from Spain imported for marmalade manufacturing, with entry limited to northern ports and for use in northern factories under full control, the process including prompt cooking of the fruit and the burning of all waste, including packing material and crates.
>
> 3. Avocados from the West Indies. The question of the importation of such avocados was not raised at the fruit fly hearing of 19th December, 1922, and in drafting the quarantine the entry of avocados from the West Indies was not provided for. This omission was due to oversight, or rather to the failure of growers or importers or others in interest to bring the need for the entry of this fruit to the attention of the Department. Inasmuch as the quarantine provides for the entry of citrus fruit from the West Indies, and as the avocado, so far as known, is even less open to the question of risk of bringing pests than citrus fruit, it seems unreasonable to exclude avocados originating in the same localities. Entry of avocados, as with West Indian citrus fruit, will, however, be limited to northern ports, at least until it can be fully determined, both by field studies in the West Indies and by examination of the imported fruit, that such fruit is free from all risk whatsoever, in which case entry may be provided for at any port.

It seems desirable to bring to the attention of all permittees under the new fruit and vegetable quarantine (No. 56), promulgated by this Department, effective 1st November, 1923, that while this quarantine permits the entry of lemons and certain other fruits and most of the vegetables under permit, and without restriction as to quantity, this permission with respect to lemons particularly is under the belief that properly-cured and well-selected lemons will not be a means of introduction into the United States of the Mediterranean fruit fly. It is known, however, that this fruit fly will place its eggs in lemons and may come to maturity in bruised or otherwise injured and in overripe lemons. It should be a matter of particular concern, therefore, on the part of the grower and shipper to see that the fruit is absolutely sound and free from injury and not overripe, or in any condition likely to increase the chance of infestation by or carriage of fruit flies.

It is desirable also that similar precautions should be taken in the selection of other permitted fruits, including bananas, pineapples, sour limes, and grapes of the European or vinifera type, or any other fruit, and also any vegetable, the entry of which into the United States is permitted under the quarantine.

It is urged that permittees instruct the growers or exporters with whom they are dealing to so select and grade their lemons and other fruits and vegetables as to eliminate conditions which may increase the risk of including infested material, or subject the shipment to the suspicion of infestation through the inclusion of culls, overripe, or damaged products. By so doing, any necessity for the enforcement of additional restrictions may be largely avoided. Such shippers and growers should also be warned to see that the shipments are free from leaves, twigs, or other portions of plants used as packing or otherwise.

Regulations Under "The Stock Foods Act of 1919."

The Regulations under "*The Stock Foods Act of* 1919," dated 15th January, 1920, have been revoked and new Regulations in lieu thereof appear in the *Government Gazette* of the 22nd December, 1923, from which it is noted that a copy must be constantly affixed in or on some conspicuous place in every shop, shed, or warehouse where stock foods are sold.

Regulation 1 gives a list of the mixed, concentrated, or prepared stock foods or by-products that require to be labelled; also a list of stock foods of low food value.

The Schedule sets out the different substances that are prescribed as foreign ingredients; also the proportion or amount of such foreign ingredients allowed.

Attention is directed to both the Schedule and definitions, in particular those relating to bran, pollard, and calf foods, as well as to the foreign ingredients which include bunt (*Tilletia tritici*).

Regulation 9 prescribes the form of statutory declaration to be forwarded by every wholesale seller of mixed, concentrated, or prepared stock food or prescribed by-product.

A wholesale seller under the Act is:—"Any person who, whether as manufacturer, importer, or wholesale seller, is primarily responsible for putting on the market any mixed, concentrated, or prepared stock food or any prescribed stock food."

If the wholesale seller of any stock food is not resident in the State of Queensland, the requirements of section 3 of the Act may be complied with by a duly authorised agent of such seller resident in Queensland, and such agent shall, for the purposes of the Act, be deemed to be the wholesale seller of the stock food.

The Queensland Agricultural High School.

The Queensland Agricultural High School and College was opened at the beginning of the month under the direction of Mr. J. K. Murray, B.A., B.Sc., N.D.D. The courses at the institution have been so designed that sound education as well as practical and theoretical instruction in agriculture and animal husbandry will be provided. A junior as well as a senior course has been planned, but, as accommodation is limited, it is not intended to receive junior students in the course of the current year. Ultimately, with the institution of a junior course, the term of the senior course will be reduced to two years. The senior course will qualify students for entry to the University agricultural course. After two years' further study under University auspices, students may qualify for a diploma in agriculture. The chief intention, however, is to give the State each year a group of young farmers, admittedly lacking in experience, but thoroughly practical in their outlook and ability and provided with the world's latest knowledge of scientific methods as applied to the practice of agriculture.

Staff Changes and Appointments.

Mr. F. B. Rutledge has been appointed Government representative on the Adavale Dingo Board, and Messrs. W. Hazlett, E. R. Maule, J. Presnell, and J. R. Wade have been elected members of that Board.

Messrs. W. J. Malone, J. H. Ledlie, W. E. Challacombe, and J. K. Casey have been elected members of the Carpentaria Dingo Board.

Messrs. R. Bushnell, T. E. Green, A. E. Jones, and A. Graham have been elected members of the Burnett Dingo Board.

Police Constables D. Crane, T. J. King, S. D. Beakey, and W. J. Laing have been appointed inspectors under and for the purposes of "*The Slaughtering Act of* 1898."

The appointment of Mr. L. L. Gudge as Cotton Classer, Department of Agriculture and Stock, has been confirmed as from the 1st July, 1923.

Mr. J. P. Orr, Clerk, Fruit Branch, Department of Agriculture and Stock, has been also appointed Acting Registrar of Primary Producers' Co-operative Associations under and for the purposes of "*The Primary Producers' Co-operative Associations Act of* 1923."

Mr. R. E. Haseler has been admitted to the Professional Division of the Public Service and appointed Assistant Grader (Senior), Cotton Section, Department of Agriculture and Stock, as from the 22nd December, 1923; such appointment to be on probation for six months.

Mr. E. J. Shelton has been appointed an officer under the Stock, Slaughtering, and Dairy Produce Acts.

Mr. A. R. Charles has been appointed Government Representative on the Western Downs Dingo Board, and Messrs. E. W. Dowling, W. J. Tomkins, W. R. Bracker, and G. F. W. Goodrich have been elected members of that Board.

The Police Magistrate, Charleville, has been appointed Government Representative on the Warrego Dingo Board, and Messrs. J. W. S. Gildea, J. O'Sullivan, M. L. Williams, and W. W. B. Hogarth have been elected members of that Board.

Mr. F. A. Richter has been appointed an Honorary Inspector under the Diseases in Plants Act.

The appointment of Mr. A. Hamilton as Agricultural Field Assistant, as from the 19th May, 1923, has now been confirmed.

Messrs. G. Evans, W. G. Wells, K. V. Henderson, R. R. Anson, J. Carew, A. Nagle, T. Y. Bonar, S. T. J. Clarke, R. W. Peters, L. L. Gudge, and W. H. Franklin, have been appointed inspectors under and for the purposes of "*The Cotton Industry Act of* 1923."

The Officer in Charge of Police, Bollon, has been appointed an acting inspector of stock.

The appointment of Mr. Alfred Nagle as Agricultural Field Assistant, as from the 19th May, 1923, and as Senior Field Assistant, Cotton Section, Department of Agriculture and Stock, as from the 12th October, 1923, has been confirmed.

Mr. J. E. N. Bell has been appointed Government Representative on the Dawson Dingo Board, and Messrs. A. K. Cullen, C. Knack, R. L. Scott, and J. Mundell have been elected members of that Board.

Mr. F. W. Becker has been appointed an officer under and for the purposes of "*The Diseases in Plants Act of* 1916."

The resignation of Mr. Jas. Carew as Inspector of Stock, Brands, and Slaughter-houses, has been accepted as from the 31st January, 1924.

The following have been appointed members of the Dingo Boards for the undermentioned Dingo Districts:—

Wide Bay.—Henry James Hyne, Norman George Hall, John Caradoc Evans, and Frederick McDonald Hooke.

Condamine.—William Nash (Government Representative), Edward J. Ryan, George Mundell, Daniel H. Butler, and James W. Newbery.

Kennedy.—Hugh George Alston, Henry John Atkinson, Leland Edwin Challands, and William Stanley Collings Warren.

St. George.—Donald Norman Roylston Munro, Frank Leslie Treweeke, Ernest Henry Walmsley, and Walter Henry Wippell.

Alexander Percy Devereux has been appointed an honorary inspector under and for the purposes of "*The Diseases in Plants Act of* 1916."

The following have been appointed Government Representatives on the St. George, Wide Bay, and Mitchell West Dingo Boards, respectively:—Wm. D. Cameron, John Taylor, and C. B. P. Bell.

A. McT. Thorburn and H. Collard have been appointed Inspectors under and for the purposes of "*The Diseases in Plants Act of* 1916."

C. R. St. Clair Von Stieglitz, Assistant under the provisions of "*The Sugar Experiment Stations Act of* 1900," has been appointed Analyst, Agricultural Chemical Laboratory, as from the 1st July, 1924.

John Stuart, of Glen Alvon, has been appointed an Honorary Inspector of Stock.

The following have been elected Members of the Dingo Board for the Dingo District of Mitchell West:—William Avery, Angas N. Mackay, James McC. Kowatson, and William L. Cowen.

The following appointments have been made in the Advances to Settlers Branch, State Advances Corporation:—A. P. Deshon to be Assistant Manager, A. C. Palmer to be Senior Clerk, R. R. Craig, A.F.I.A., to be Accountant, and J. L. Gasteen to be Securities Officer.

The appointment of Mr. A. E. V. Richardson, M.A., B.Sc., as a member of the committee appointed to investigate the disease known as "Bunchy Top" in bananas has been rescinded, and Mr. T. G. B. Osborn, D.Sc., has been appointed in his stead to represent the Commonwealth Institute of Science and Industry.

Mr. Charles Cooke, of Riversleigh, Upper Pilton, Clifton, has been appointed an Inspector of Stock.

Economics of the Sugar Industry.

If the estimate of 260,000 tons of raw sugar for Queensland is realised, the crop should be of the value of £7,020,000 to this State.

The second highest yield of sugar in Queensland was produced last year, viz., 287,780 tons, the record output being 307,714 tons in the year 1917. Although the yield of sugar was so good in 1922, it was the result of the greatly increased acreage of cane planted as the outcome of the 1920 agreement between the Federal and State Governments and the high sugar content in the cane, rather than of an increased yield of cane per acre, as climatic conditions generally were unfavourable to a maximum crop. During the wet season period—January to April—1922, the usual volume of rain did not fall, the Southern rainfall being particularly low. Good rains were experienced in June and July, which considerably improved the crop for the time being, but the remainder of the year, unfortunately, proved very dry. The 1922 season was the last one covered by the agreement whereby the price of raw sugar was fixed at £30 6s. 8d.

Under this agreement the sugar industry progressed very considerably. At the commencement of the three-year period there was a feeling of security in knowing that the industry was not to be interfered with for that time. As pointed out in last year's report, this led to the bringing of new areas under cane, the opening up of new districts, and the increasing of the capacity and efficiency of nearly every sugar-mill. The yield of sugar in 1921 and 1922 overtook the consumption and conclusively proved what could be done if stability were afforded to the industry.

The total acreage under cane in 1922 was estimated by the Government Statistician to be 202,303 acres—the greatest area ever put under this crop, being an increase of 39,584 acres above that of 1920 and 17,690 above that of 1921. Of this area 140,850 acres were crushed, this being also the largest area of cane ever cut, exceeding by 17,894 the acreage cut in 1921.

The balance of 61,353 acres not cut during the 1922 season included cane allowed to stand over till 1923, cane cut for plants, and cane planted for 1923. The average yield of cane per acre, due to the drought, was not so good as in the previous year, being only 15.39 tons, as against a yield of 18.60 tons in 1921. The total tonnage of cane harvested was 2,167,990 tons, a decrease on the previous year's figures. The yield of sugar per acre was 2.04 tons per acre, also lower than the yield of 1921.

It is pleasing to note that, due to the activities of the Bureau of Sugar Experiment Stations and the Cane Prices Board creating a demand for better varieties of cane, and also due to the higher efficiency in our raw sugar-mills, the tons of cane taken to make 1 ton of sugar has improved considerably in recent years, but the year 1922 saw the lowest figure yet obtained in this respect, viz., 7.53 tons of cane to 1 ton of sugar. This was, however, partly owing to the drier season producing a higher density cane in the wetter areas, such as Babinda and Innisfail.

The return of molasses manufactured is given as 10,318,879 gallons, made up as follows:—

	Gallons.
Sold to distillers	1,671,484
Burnt as fuel	2,539,142
Used or sold for feed	1,916,393
Sold for other purposes	102,740
In stock	803,050
Used for manure	322,113
Run to waste	2,963,957
	10,318,879

—23rd Ann. Rpt., Bur. Sugar Expt. Stns., Q.

Rinderpest Precautions.

In connection with the outbreak of rinderpest in Western Australia, the New Zealand authorities have now amended their Quarantine Regulations to provide that Ministerial consent must be obtained for the importation of sheep and pigs from Australia. The introduction of fodder into New Zealand form Australia is totally prohibited.

Co-operative Companies.

A Declaration has been issued under "*The Primary Producers' Co-operative Associations Act of* 1923," declaring the following companies to carry on operations of a co-operative nature in relation to primary produce: –

(1) The Maryborough Co-operative Dairy Co., Ltd., Maryborough.
(2) Wide Bay Co-operative Dairy Co., Ltd., Gympie.
(3) Kin Kin Co-operative Dairy Co., Ltd., Kin Kin.
(4) The Maleny Co-operative Dairy Co., Ltd., Maleny.
(5) Caboolture Co-operative Co., Ltd., Caboolture.
(6) The South Burnett Co-operative Co., Ltd., Murgon.
(7) Nanango Co-operative Dairy Co., Ltd., Nanango.
(8) The Esk Co-operative Dairy Co., Ltd., Esk.
(9) The Terror's Creek and Samson Vale Co-operative Dairy Co., Ltd., Dayboro'.
(10) The Downs Co-operative Dairy Co., Ltd., Toowoomba.
(11) Roma Co-operative Dairy Co., Ltd., Roma.
(12) The Chinchilla Co-operative Dairy Co., Ltd., Chinchilla.
(13) The Oakey District Co-operative Butter Co., Ltd., Oakey.
(14) Goombungee Co-operative Dairy Co., Ltd., Goombungee.
(15) The Rockhampton District Co-operative Dairy Co., Ltd., Rockhampton.
(16) The Central Queensland Dairyman's Co-operative Co., Ltd., Rockhampton.
(17) The Farmers and Producers' Co-operative Co., Ltd., Rockhampton.
(18) Dawson Valley Co-operative Co., Ltd., Wowan.
(19) The Port Curtis Co-operative Dairy Co., Ltd., Gladstone.
(20) Bundaberg Co-operative Dairy Co., Ltd., Bundaberg.
(21) Gayndah Co-operative Dairy Co., Ltd., Gayndah.
(22) The Warwick Butter and Dairying Co., Ltd., Mill Hill, Warwick.
(23) The Logan and Albert Co-operative Dairy Co., Ltd., Beaudesert.
(24) The Southern Queensland Co-operative Dairy Co., Ltd., Kingston.
(25) The Stanley River Co-operative Co., Ltd., Woodford.
(26) The Queensland Farmers' Co-operative Co., Ltd., Booval.
(27) The Atherton Tableland Co-operative Butter and Bacon Co., Ltd., Atherton.

Regulations passed under "*The Primary Producers' Co-operative Associations Act of* 1923," provide—

(*a*) That every Company registered under "*The Companies Acts,* 1863 *to* 1913," and every society registered under "*The Industrial and Provident Societies Act of* 1920" must, within the period commencing on the 1st February, 1924, and ending on the 30th June, 1924, hold a meeting of its members to decide whether or not such company or society will cease to be registered under the Acts or Act under which it is registered and apply to become registered as an Association under "*The Primary Producers' Co-operative Associations Act of* 1923," and for this purpose alter its rules and constitution in such a manner as will entitle it to be registered as an association under the Act;

(*b*) Each of the companies undermentioned must hold such a meeting on the date specified; and

(*c*) Fixing the penalty for a breach of the Act at an amount not to exceed £20.

(The names of the companies are enumerated above, while the dates of the meetings correspond with the order of the names of the companies):—

Day and date of meeting:—

(1) Tuesday, 12th February, 11 a.m.
(2) Wednesday, 13th February, 1.30 p.m.
(3) Thursday, 14th February, 11 a.m.

(4) Friday, 15th February, 2 p.m.
(5) Saturday, 16th February, 11.30 a.m.
(6) Wednesday, 20th February, 11.15 a.m.
(7) Thursday, 21st February, 11.15 a.m.
(8) Friday, 22nd February, 11.15 a.m.
(9) Saturday, 23rd February, 11.15 a.m.
(10) Tuesday, 4th March, 12 noon.
(11) Wednesday, 5th March, 11.15 a.m.
(12) Thursday, 6th March, 2.30 p.m.
(13) Friday, 7th March, 1.30 p.m.
(14) Saturday, 8th March, 10.45 p.m.
(15) Wednesday, 12th March, 10.30 a.m.
(16) Wednesday, 12th March, 12 noon.
(17) Wednesday, 12th March, 3 p.m.
(18) Thursday, 13th March, 11.15 a.m.
(19) Friday, 14th March, 1.45 p.m.
(20) Wednesday, 19th March, 11.15 a.m.
(21) Friday, 21st March, 11 a.m.
(22) Wednesday, 26th March, 10.30 a.m.
(23) Thursday, 27th March, 11.30 a.m.
(24) Friday, 28th March, 11.15 a.m.
(25) Tuesday, 1st April, 1.15 p.m.
(26) Wednesday, 2nd April, 12 noon.
(27) Wednesday, 16th April, 12 noon.

An Order in Council under "*The Primary Producers' Organisation Acts*, 1922 *to* 1923," has been issued revoking a previous Order in Council, and constituting new boundaries for nineteen different districts, for the purposes of the Act.

Swingle-Bars—A Seven-horse Set of Equalisers.

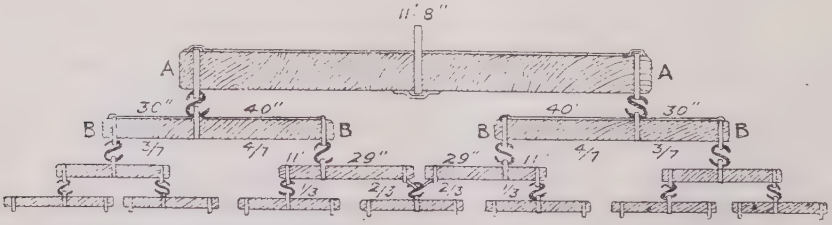
The accompanying illustration sets out the dimensions for a seven-horse set of equalisers, which will be found useful where large teams are utilised:—

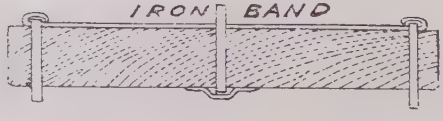
If the swingle-bars are constructed from split instead of sawn timber, and are strengthened in the manner shown in the illustration, they are practically everlasting, provided, of course, that fair usage is given.

Old buggy tyres, especially those known as "half-round," form excellent material for strengthening bands, whilst the rest of the fittings are quite within the scope of the handy man who can weld a piece of iron and make an S hook.

As will be noticed, this set has an added recommendation by reason of the fact that the centre set of three-horse equalisers could be used separately by the addition of a "king bar," and two two-horse sets are also available, and can be similarly converted into a four-horse set.

For ordinary use, single-horse bars should measure a clear 27 inches between the points of draught, with a total length of bar overall of 30 inches.—A. E. GIBSON, Instructor in Agriculture.





Forthcoming Shows.

The Queensland Chamber of Agricultural Societies has supplied the following list of show dates for 1924:—

Stanthorpe: 6th to 8th February.
Warwick: 13th to 15th February.
Goombungee: 6th March.
Pittsworth: 12th March.
Killarney: 19th and 20th March.
Toowoomba: 25th to 27th March.
Royal National Fat Steer Show: 29th March.
Dalby: 2nd and 3rd April.
Chinchilla: 8th and 9th April.
Nanango: 3rd and 4th April.
South Brisbane: 5th April.
Wallumbilla: 15th and 16th April.
Clifton: 16th and 17th April.
Herberton, 21st and 22nd April.
Oakey: 24th April.
Maleny: 23rd and 24th April.
Goondiwindi: 29th and 30th April.
Taroom: 6th and 7th May.
Blackall: 6th and 7th May.
Toogoolawah: 7th and 8th May.
Wondai: 8th and 9th May.
Boonah: 14th and 15th May.
Springsure: 14th and 15th May.
Murgon: 15th and 16th May.
Kilkivan: 21st and 22nd May.
Ipswich: 21st to 23rd May.
Emerald: 21st and 22nd May.
Beaudesert: 28th and 29th May.
Marburg: 2nd and 3rd June.
Esk: 4th and 5th June.
Maryborough: 3rd to 6th June.
Childers: 10th and 11th June.
Bundaberg: 12th to 14th June.
Pine Rivers: 13th and 14th June.
Lowood: 20th and 21st June.
Rockhampton: 24th, 26th, 27th, and 28th June.
Mackay: 3rd to 5th July.
Kilcoy: 3rd and 4th July.
Biggenden: 3rd and 4th July.
Bowen: 9th and 10th July.
Caboolture: 17th and 18th July.
Sunnybank: 19th July.
Barcaldine: 22nd and 23rd July.
Rosewood: 23rd and 24th July.
Ithaca: 25th and 26th July.
Nambour: 30th and 31st July.
Mount Gravatt: 2nd August.
Humpybong: 7th August.
Royal National: 11th to 16th August.
Gympie: 20th and 21st August.
Belmont: 23rd August.
Imbil: 27th and 28th August.
Crow's Nest: 4th September.
Wynnum: 6th September.
Beenleigh: 11th and 12th September.
Zillmere: 13th September.
Stephens: 20th September.
Rocklea: 27th September.
Southport: 10th October.

Answers to Correspondents.

Mangosteen Tree (*Garcinia xanthochymus*).

L.W. (Cairns)—

The Government Botanist (Mr. C. White, F.L.S.) advises that the mangosteen referred to is *Garcinia xanthochymus*, a native of India. It is cultivated in a few gardens in North Queensland, but is not common. Its fruit is not of much value, but the tree is worthy of cultivation for its interest and beauty. It propagates very readily from seed.

Matchbox Beans (*Entada scandens*).

There is no great existing demand for matchbox beans. Any Brisbane nurseryman will supply information as to disposal.

Rhodes Grass.

A.T. (Toowoomba)—

Rhodes grass grown on rather poor soil near Brisbane was compared with locally-procured good-looking samples of chaff. Analyses showed that practically double the value of protein contents was present in Rhodes grass as compared with the oaten and wheaten chaff. An analysis of samples of Sudan grass grown at Gatton College and Hermitage State Farm also showed protein content considerably higher than that of oaten or wheaten chaff. For Results *see* next page.

RESULTS.

	Moisture.	Crude Protein.	True Protein.	Carbohydrates.	Crude Fibre.	Crude Fat.	Digestible.				Nutritive Ratio, 1.	Starch Value.	Lb. Fodder to Give.	
							Protein.	Carbo-hydrates.	Fibre.	Fat.			Starch equivalent to 11 lb. Starch.	Protein equivalent to 1·9 lb. Protein.
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Rhodes grass, young growth, 2nd cut	9·41	15·02	8·76	29·60	32·50	1·20	5·00	18·92	19·50	·63	8·0	44·4	25	38
Rhodes grass, 2½ months' old, just flowering	12·82	12·41	6·98	33·25	28·82	1·00	3·98	21·25	17·28	·53	10·0	43·3	25	48
Rhodes grass, 3½ months' old, full flower	10·44	11·10	6·26	33·53	33·53	1·03	3·57	21·41	20·08	·54	12·0	45·9	24	53
Wheaten chaff	10·27	5·83	4·23	44·20	32·20	1·06	2·41	28·30	19·30	·56	20·3	51·1	21	79
Oaten chaff	10·64	4·39	3·97	47·50	29·05	2·12	2·26	30·40	17·42	1·12	22·3	52·4	21	85
Sudan grass from Gatton College (dried)	10·73	8·47	5·69	41·40	28·38	0·71	..	..	..	..	..	..	..	..
Sudan grass from Hermitage State Farm (dried)	8·86	12·35	6·91	44·76	23·73	1·04	..	..	..	..	11·2	47·6	23·1	48·2

Orchard Notes for March.

THE COASTAL DISTRICTS.

As soon as the weather is favourable, all orchards, plantations, and vineyards that have been allowed to get somewhat out of hand during the rainy season should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

The cooler weather will tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become overdeveloped before it is packed, otherwise it may arrive at its destination in an overripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits, does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892, and which has again proved its superiority in the recent shipments of oranges from the Southern States to England. Failing this case, a bushel-case suggested by the New

South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches but is not included in the schedule of the regulations under "*The Fruit Cases Acts,* 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach-moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit is being given in the Granite Belt area during the present season by Mr. Rowlands, the Fruit Packing Expert, whose practical advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

Parrots are frequently very troublesome in the orchards at this time of the year, especially if there is a shortage of their natural food. So far, there is no very satisfactory method of combating them, as they are very difficult to scare, and, though shooting reduces their numbers considerably, they are so numerous that it is only a subsidiary means.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening state, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the next few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—*i.e.*, spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in air tight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bag or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1924.	JANUARY.		FEBRUARY.		MARCH.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·1	6·49	5·25	6·46	5·46	6·23
2	5·2	6·50	5·26	6·46	5·47	6·22
3	5·3	6·50	5·27	6·45	5·47	6·21
4	5·3	6·50	5·28	6·44	5·48	6 20
5	5·4	6·50	5·29	6·43	5·48	6·19
6	5·5	6·51	5·30	6·43	5·49	6·17
7	5·5	6·51	5·30	6·42	5·49	6·16
8	5·6	6·51	5·31	6·41	5·50	6·15
9	5·6	6·51	5·32	6·40	5·50	6·14
10	5·7	6·51	5·33	6·39	5·51	6·13
11	5·8	6·51	5 33	6·39	5·51	6·12
12	5·9	6·51	5·34	6·38	5·52	6·11
13	5·10	6·51	5 35	6·38	5·53	6·10
14	5·11	6·51	5·36	6·37	5·54	6·9
15	5·12	6·51	5·36	6·36	5·54	6·7
16	5·12	6·51	5·37	6·35	5·55	6·6
17	5·13	6·51	5·38	6·35	5·56	6·5
18	5·14	6 50	5·38	6·34	5·56	6·4
19	5·15	6·50	5·39	6·33	5·57	6·3
20	5·16	6 50	5·40	6·32	5·57	6 2
21	5·16	6·50	5·40	6·32	5·58	6·0
22	5·17	6 50	5·41	6·31	5·58	5·59
23	5·18	6·49	5·41	6·30	5·59	5·58
24	5·19	6·49	5·42	6·29	5·59	5·57
25	5·20	6·49	5 42	6·28	6·0	5·56
26	5·20	6·48	5·43	6·27	6·0	5 55
27	5·21	6·48	5·44	6·26	6·1	5·53
28	5·22	6·47	5 45	6·25	6·1	5·52
29	5·23	6·47	5·45	6·24	6·2	5 51
30	5·24	6·46	...	...	6·2	5·50
31	5·25	6·46	...	...	6·3	5·49

PHASES OF THE MOON, OCCULTATIONS, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania, when "Summer" Time is not used.

6 Jan.	●	New Moon	10 48 p.m.
14 ,,	☾	First Quarter	8 45 a.m.
22 ,,	○	Full Moon	10 57 a.m.
29 ,,	☽	Last Quarter	3 53 p.m.

Perigee 4th Jan., at 8·12 p.m.
Apogee 16th Jan., at 2·42 p.m.

On 1st January, at midday, the earth was 3,000,000 miles nearer to the sun than it will be on 3rd July at 11 p.m. Mercury will be at inferior conjunction with the sun on the 13th at 2 p.m. The moon will pass above the planet Neptune on the 24th at 7 p.m., at an apparent distance of about three times its diameter.

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5 Feb.	●	New Moon	11 38 a.m.
13 ,,	☾	First Quarter	6 9 a.m.
21 ,,	○	Full Moon	2 7 a.m.
27 ,,	☽	Last Quarter	11 15 p.m.

Apogee 13th Feb., at 11·42 p.m.
Perigee 26th Feb., at 1·54 a.m.

The planets Venus and Uranus will be apparently remarkably close to one another on 1st February, Venus being the uppermost. On the 5th Mercury will be at its greatest elongation west of the sun at a distance of 25½ degrees. Neptune will be at its highest position about midnight on the 9th. Mars and Jupiter will seem to be remarkably close to one another on the 14th at about 3 a.m. There will be a total eclipse of the moon in the early hours of 21st February, when the moon will enter the earth's umbra or darker shadow a little after midnight. It will be totally eclipsed between about 1·20 a.m. and 2·57 a.m., and will leave the umbra about 4 a.m.

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6 Mar.	●	New Moon	1 59 a.m.
14 ,,	☾	First Quarter	2 50 a.m.
21 ,,	○	Full Moon	2 30 p.m.
28 ,,	☽	Last Quarter	6 24 a.m.

Apogee 12th March at 7·54 a.m.
Perigee 24th March at 3·12 a.m.

On 5th March a partial eclipse of the sun will be visible in parts of South America and South Africa, but not in Australia. The planet Uranus will be in conjunction with the sun, which will pass between the earth and Uranus, on the 8th at 6 p.m. Jupiter will be at quadrature with the sun on the 9th at midnight. Being west of the sun, it will be visible from about midnight to dawn.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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